Jan. 30, 1940. A. R. DOWNS 2,188,769

AUTOMATIC CHANGING MECHANISM FOR DISK RECORDS

Filed Oct. 1, 1937 5 Sheets-Sheet 1

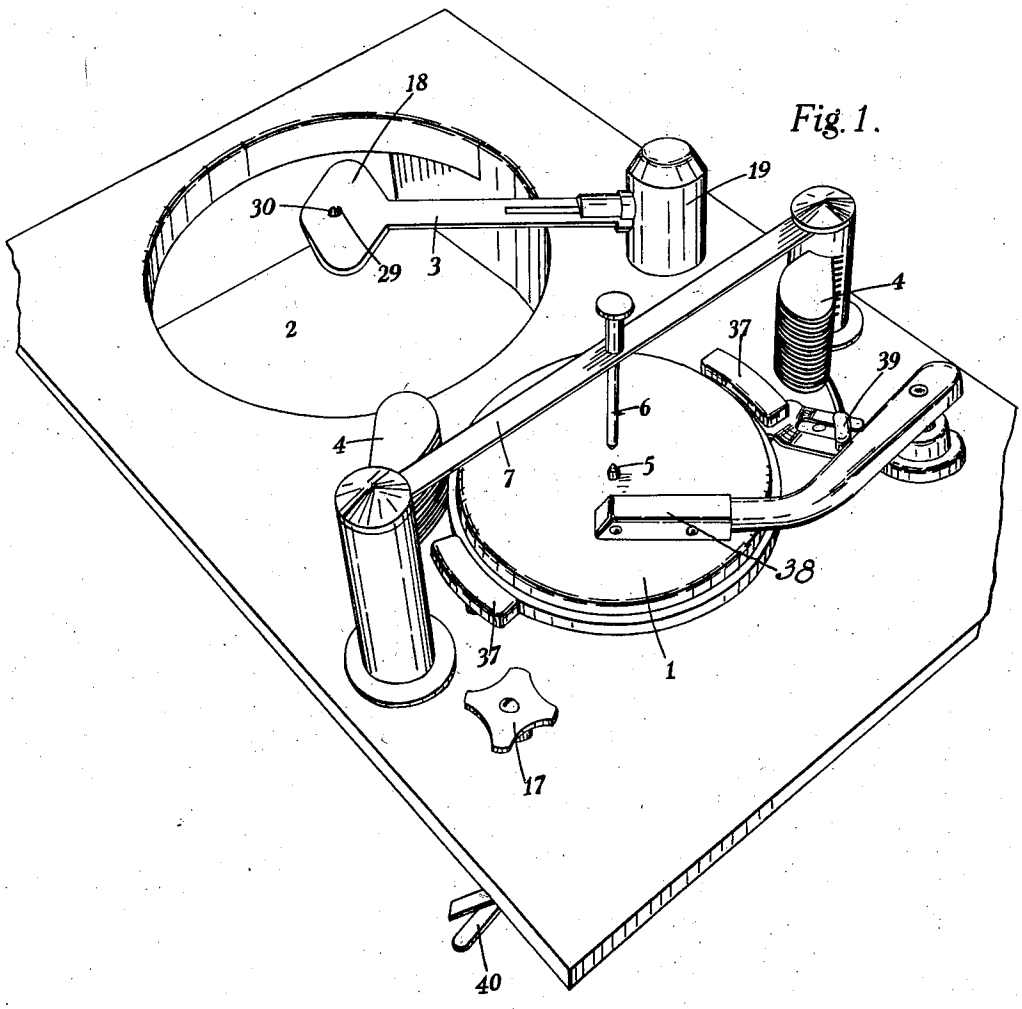


Fig. 1.

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AUTOMATIC CHANGING MECHANISM FOR DISK RECORDS

Filed Oct. 1, 1937 5 Sheets-Sheet 2

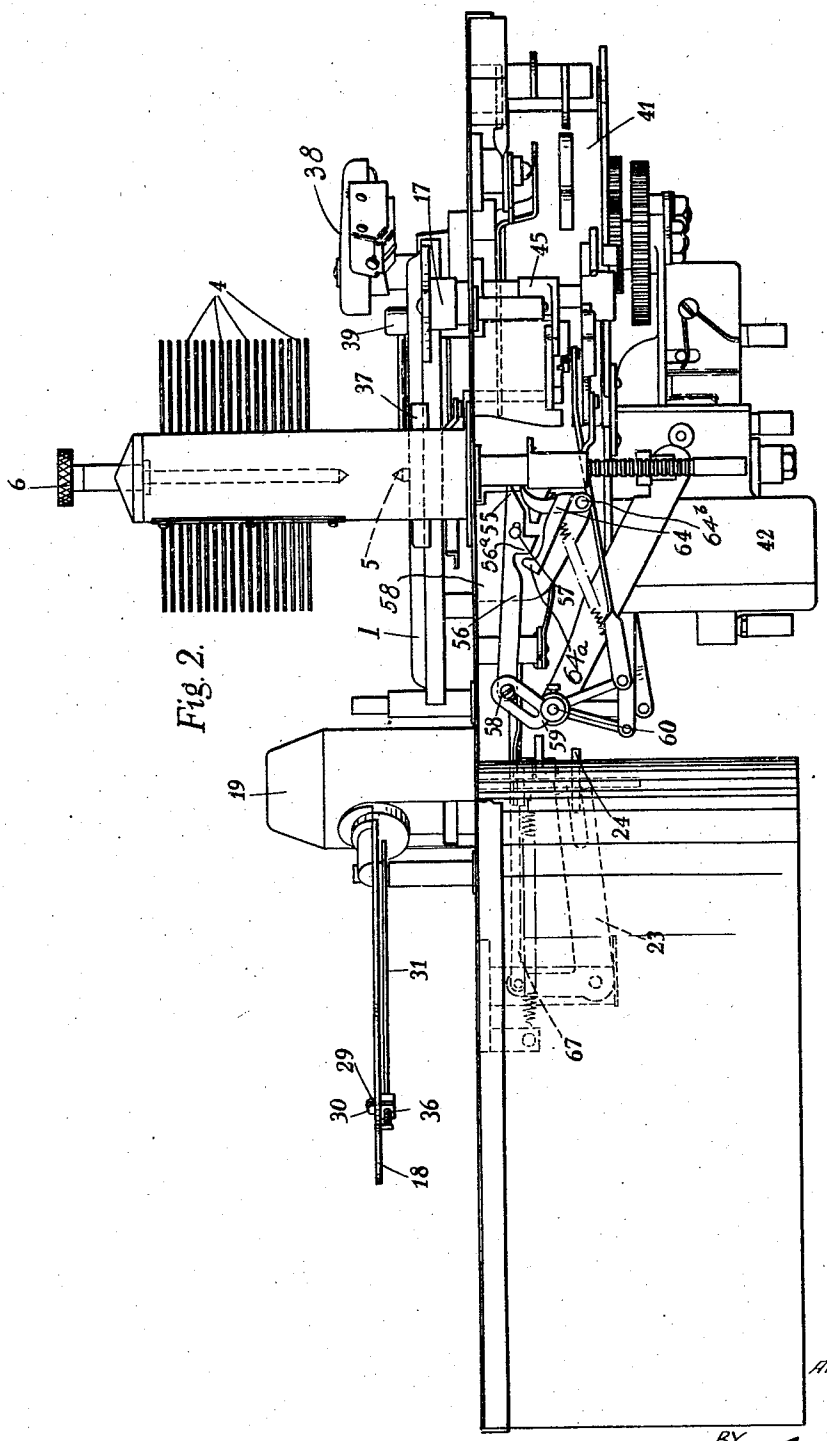


Fig. 2.

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AUTOMATIC CHANGING MECHANISM FOR DISK RECORDS

Filed Oct. 1, 1937 5 Sheets-Sheet 3

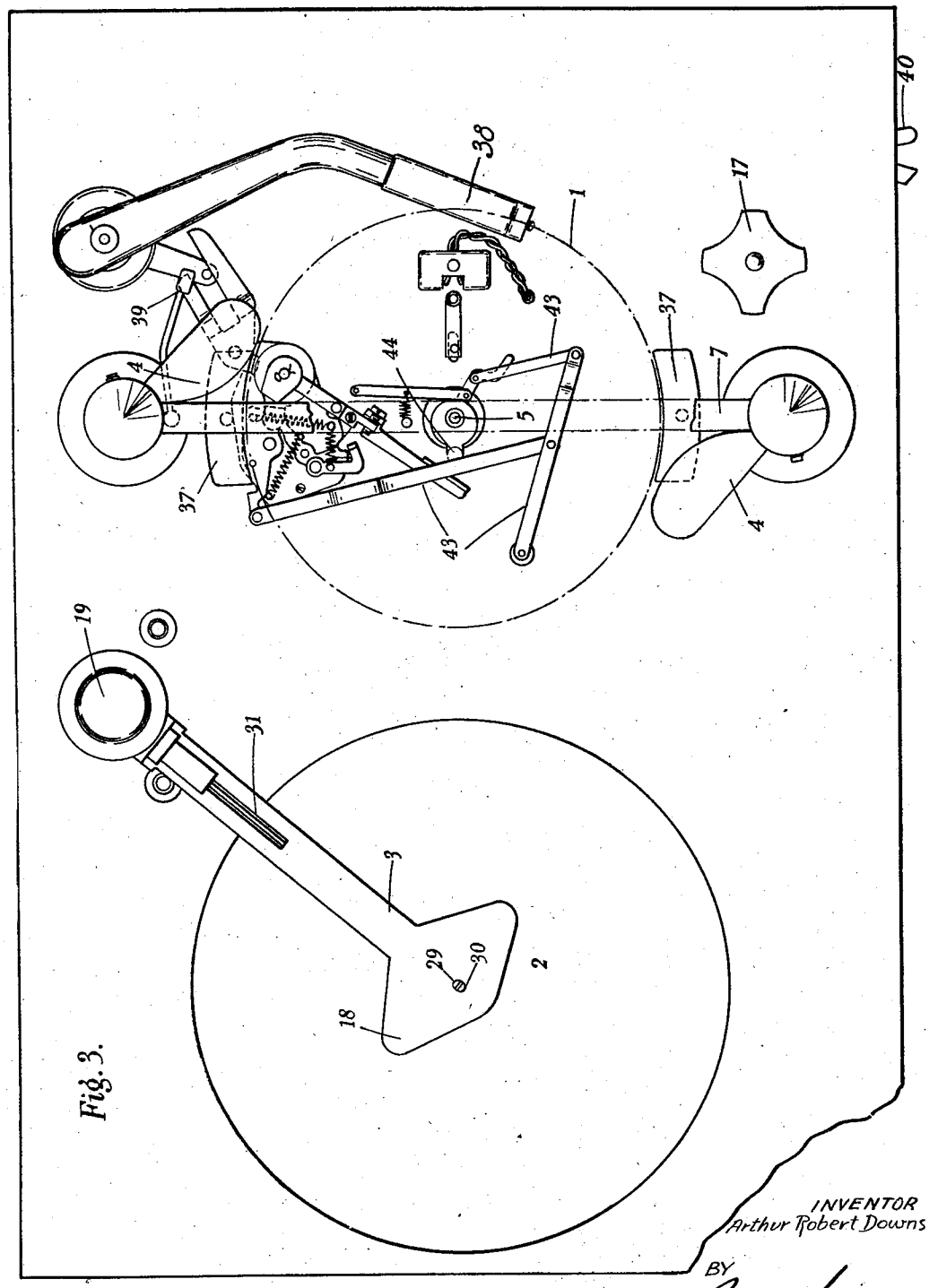


Fig. 3.

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Jan. 30, 1940. A. R. DOWNS 2,188,769

AUTOMATIC CHANGING MECHANISM FOR DISK RECORDS

Filed Oct. 1, 1937 5 Sheets-Sheet 4

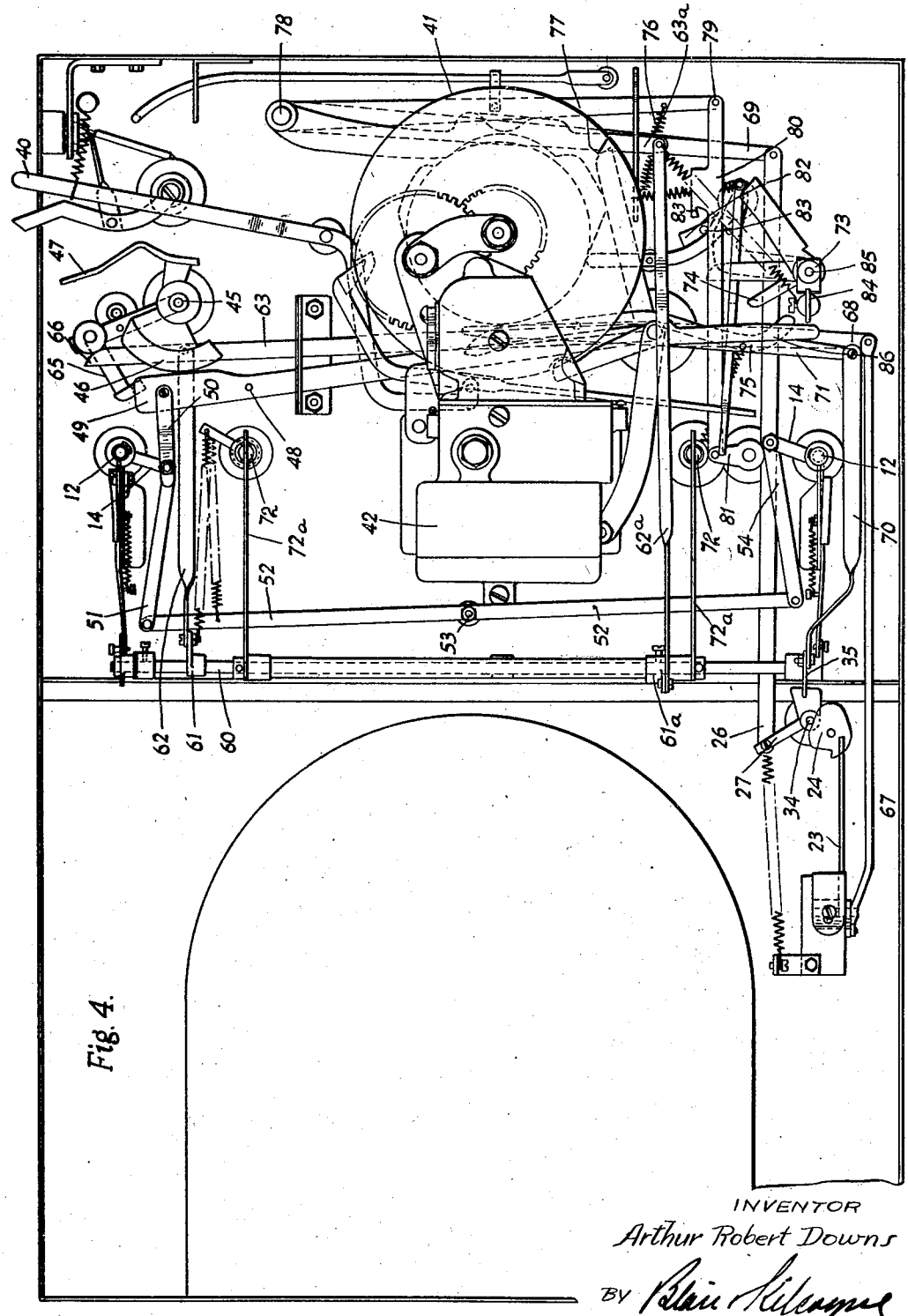


Fig. 4.

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AUTOMATIC CHANGING MECHANISM FOR DISK RECORDS

Filed Oct. 1, 1937 5 Sheets-Sheet 5

Fig. 5.

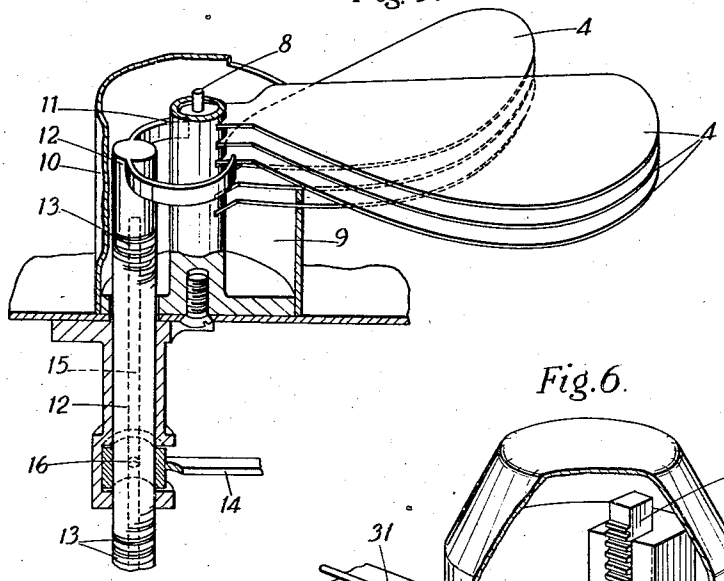
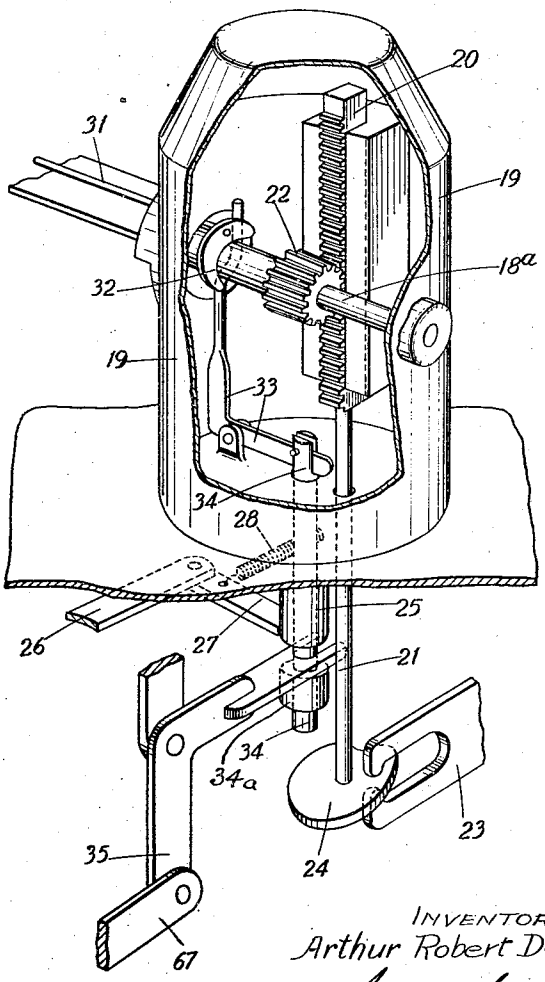


Fig. 6.



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Patented Jan. 30, 1940 2,188,769

UNITED STATES PATENT OFFICE

2,188,769

AUTOMATIC CHANGING MECHANISM FOR DISK RECORDS

Arthur Robert Downs, Brighton, England, assignor to The Garrard Engineering and Manufacturing Company Limited, Swindon, England, a British company

Application October 1, 1937, Serial No. 166,893
In Great Britain October 3, 1936

11 Claims. (Cl. 274—10)

This invention relates to automatic mechanism for use in connection with gramophones for turning over each record after one side has been played.

One of the objects of the invention is to provide an automatic mechanism which will remove the record from the playing position, turn it over after removal and then replace it so that the opposite side may be played.

A further object of the invention is to provide an automatic mechanism which will, in addition to turning over the record and replacing it for further playing, finally remove the played record from the playing position and discharge it, preferably into a receptacle provided for its reception.

A further object of the invention is to provide automatic mechanism which will deliver, preferably by gravity, one record at a time from a storage magazine onto the turntable for playing, and which, when one side has been played, will remove it from the turntable, reverse it, replace it reverse side up on the turntable and, if desired, finally remove the played record and discharge it into a receptacle.

A further object of the invention is to provide automatic mechanism which will frictionally grip the record by its centre hole, remove it from the turntable, reverse it whilst so engaged and replace it reverse side up on the turntable.

A further object of the invention is to provide automatic mechanism as in any of the preceding paragraphs in which means are provided for lifting the record off the turntable to engage it with the gripping means by lowering the record into engagement with said gripping means and/or by pushing the same upwards into the engaging position.

Other objects will appear from the following description and the appendant claims.

In order that the invention may be clearly understood and carried into effect apparatus according to one embodiment of the same will now be described, by way of example, by aid of the accompanying drawings in which:

Fig. 1 is a view, in perspective, showing the parts of the mechanism which appear above the motorboard and including, in addition to the turntable and the receptacle for played records, means for stacking the records to be played and for delivering the same by gravity one at a time to the turntable, means for gripping, removing, reversing, replacing and rejecting each record and the means for lifting the record from the turntable preparatory to its engagement by the gripping means.

Fig. 2 is a side elevation showing the mechanism both above and below the motorboard.

Fig. 3 is a top plan view with the turntable removed.

Fig. 4 is an underside or inverted plan view.

Figs. 5 and 6 are sectional perspective views of details hereafter to be referred to.

In the embodiment illustrated in the drawings the mechanism for performing the functions of changing and reversing the records is located above the motorboard whilst the motor driven operating mechanism for controlling automatically the performance of such functions is located below the motorboard.

In the present specification the description of the illustrated apparatus will be divided into two parts; in the first part will be described the functions and necessary details of construction of the mechanism which is above the motorboard, whilst in the second part will be described the construction and operation of the operating mechanism below the motorboard and its operative association with the mechanism above the motorboard.

Changing reversing mechanism

This broadly comprises (1) the means for storing the records to be played and for delivering the same one at a time to the gramophone turntable and (2) the means for reversing each record and for discharging the same both automatically in the normal series of operations and prematurely by predetermination on the part of the operator.

Referring now to the drawings 1 indicates the usual motor driven turntable on which the records are played, 2 the receptacle for played records and 3 the swinging arm which effects both the reversal of each record and its removal from the turntable to a position above the receptacle 2.

The records selected for playing are supported in spaced relationship in the form of a column above the turntable onto which they are permitted to fall one by one for playing. The means shown for this purpose comprise a series of vanes 4 each movable independently of the other and arranged as two columns on opposite sides of the turntable, each column containing an equal number of vanes. By this arrangement the vanes in the two columns form opposing pairs, each pair serving for the support of a single record.

Alignment of the records one above the other and with their central holes directly above the projecting end of the motor spindle 5 in the centre of the turntable is ensured by means of a depending pin 6 which, in the example illustrated

is shown as being supported above the turntable by a cross-bar 7. The vanes in each column are mounted to turn about a vertical pivot pin 8, see Fig. 5, and they are supported in parallel spaced relationship by a slotted standard 9 co-axial with the pivot pin 8 and by corresponding slots in a vertical tubular casing 10. There is thus provided a two point support for each vane which is sufficient to enable each vane to support its proportion of the weight of a record without bending.

The records are released for playing one at a time automatically from the lowest upwards by the removal of each pair of supporting vanes. This is effected in the example illustrated by imparting simultaneously a lateral swinging movement to the vanes in each pair by means comprising a crescent shaped striker 11, mounted at the upper end of a rod 12. This rod is adapted to receive a step by step vertical lift to bring the long side of the striker into registration with the stem of each vane in turn and a turning motion to cause the striker to displace the selected vane from its supporting position beneath a record.

These movements are imparted respectively through the medium of rack teeth 13 on the rod 12 and an oscillating lever 14 which engages in a vertical groove 15 in the rod 12 by means of a pin 16. The further actions of these operating means will be described hereafter in connection with the mechanism which is disposed below the motorboard.

An opposite movement is imparted to the striker to reposition each pair of vanes when loading up with records by means of a hand operated knob 17, see Fig. 1.

The means for reversing each record and for transferring the same from the turntable to a position above the receptacle 2 comprises an arm 3. This arm in the example illustrated, is made from flat material which at its outer end is shaped to provide an extended supporting surface 18 to prevent tilting of an engaged record and at its inner end terminates in a spindle 18a Fig. 6 for rotatable support in bearings on opposite sides of a vertical casing member 19.

The rotary movement of the arm 3 is about its own axis and such movement is imparted by means of a rack 20 at the upper end of a pull rod 21 and a pinion 22 mounted upon the spindle 18a of the arm intermediate the aforesaid bearings supports.

Sufficient vertical movement is imparted to the rack in both directions as will turn the arm completely over on one movement of the rack and back again on the opposite movement. This vertical movement of the rack is imparted through a lever 23 one end of which is slotted for engagement with opposite sides of a foot 24 on the lower end of the pull rod 21. This form of connection permits the pull rod and foot to rotate with the casing member 19 relatively to the lever 23. The swinging of the arm 3 is effected through a corresponding motion which is imparted to the casing member 19. For this purpose the casing member is formed or provided with a depending sleeve 25 and the motion required is imparted to the sleeve by the action of a pull rod 26 on an arm 27 forming part of said sleeve. This turning motion of the casing member is resisted by a pull spring 28 which serves to return the casing member to a position where the arm 3 is above the receptacle 2.

Each record is intended to be gripped by an engagement with its central hole and for this purpose it is proposed to use in the example illustrated, a gripper consisting of two segmental portions 29 and 30 constituting together an expansible pin. These portions 29 and 30 are disposed centrally of the enlarged supporting surface 18 at the outer end of the arm 3 so as to project therefrom, the near portion 29 being fixed and the outer portion 30 being made movable relatively to the fixed portion to produce expansion and contraction of the gripper according to whether the record is to be held or released.

Relative movement of the portion 30 in a direction towards the other portion 29 is effected by mounting the same upon the outer end of a pull rod 31 the inner end of which enters the interior of the casing member 19. Mounted upon this inner end is a crescent shaped plate 32 behind which engages the upper end of the vertical arm of a bell crank lever 33, the other or horizontal arm of such lever engaging the upper end of a spindle 34. This spindle passes through and is slidable within the sleeve 25 and at its lower end it is provided with a shoulder 34a which is engaged by the forked arm of a further bell crank lever 35.

In operation a downward pull imparted to the spindle 34 produces inward movement of the vertical arm of the bell crank lever and corresponding retraction of the portion 30 of the gripper. This inward movement of the portion 30 is effected against the action of a pull spring 36 which serves to return the portion 30 to the normal or expanded position.

Arranged on opposite sides of the turntable are two vertically movable rests 37 which are shaped and positioned to engage under the overhanging portion of a positioned record to lift the same off the turntable for engagement by the gripper in a manner as will hereafter appear.

The pick-up or tone arm is indicated at 38 and this is mounted and operated so as to be moved into engagement with each positioned record and when it has reached the run-off groove at the central portion of the record to be lifted and swung back out of the playing position whilst the record is either being turned over and replaced or a fresh record is being positioned. All such movements are effected automatically in a manner hereafter to be described.

To vary the inward movement of the pick-up or tone arm to enable the same correctly to engage different sized records a gauging arm 39 is provided which projects above the motor board to engage the edge of a positioned record and "feel" the size of the same.

In operation a record is first placed in position so as to rest partly upon the turntable and partly upon the gauging arm 39. The remaining records are then arranged in a column above the turntable by positioning the same one at a time upon the ascending pairs of vanes 4, correct location being effected by threading the same upon the spindle 6.

Upon starting up the motor the gauging arm will be moved out from beneath the record, which then falls into place upon the turntable and will "feel" the size of the record. The pick-up or tone arm will then be positioned on the record and reproduction will commence.

When one side of a positioned record has been played the pick-up will be lifted and swung back to the non-playing position. The record will then be lifted by upward movement of the rests 37 and the arm 3 will be swung into position beneath it with the grippers in the closed position and projecting upwards. The rests 37 will then

descend and lower the record until the grippers project through the central hole in the same. The grippers then expand and the arm swings outwards until the record is above the opening in the motor board communicating with the receptacle 2. The arm then rotates through 180° and reverses the record. It then swings back to the playing position and brings the reversed records over the turntable. The grippers then contract and the record falls onto the raised rests which then descend and lower the record onto the turntable. The pick-up then moves into the playing position once more and the newly positioned side of the record is played.

During the playing of this reverse side of the record the arm 3 remains in the playing position with the grippers inverted. When therefore the second side of the record has been played it is lifted from the turntable by the raising of the rests 37 and positively pushed over the depending grippers which then expand. The arm, with the engaged record is then swung over the receptacle 2 when the grippers contract, releasing the record, which falls flat into the receptacle.

In the meantime the next pair of vanes in the series turn to deposit their record on the raised rests 37 which then descend and so lower the record onto the turntable for a repetition of the above described operations. These continue until all the stored records have been played or until the motor is switched off.

The mechanism beneath the motor board and hereinafter termed the operating mechanism is operated by means of cams carried by a cam drum 41 which is driven through gearing by the gramophone motor 42, a clutch, not shown, being interposed between this motor and the gearing to enable this mechanism to be stopped when the records are being played, and restarted when a record is to be reversed or removed.

This clutch is adapted to be operated automatically, by means hereinafter described, during the normal sequence of operations of the gramophone or manually by means of a clutch lever 40 to set the operating mechanism running when it is desired to effect rejection of a record during or prior to its reproduction or after reversal.

The automatic operation of the clutch is effected when the playing of one side of a record has been completed the clutch being engaged automatically to start the operating mechanism by means of a lever system 43, situated beneath the turntable on the upper surface of the motorboard and operatively associated with the pick up arm, the arrangement being such that as the pick up arm moves across the record the levers 43 are so moved that one of them is caused to approach a projection 44 carried by and rotating with the motor spindle 5. When the tone arm reaches the limit of its inward movement the projection 44 engages the adjacent lever of the system thereby imparting movement to the same such movement being transmitted through suitable mechanism, not shown, to the clutch.

Assuming that the magazine is empty both sets of vanes are in their extreme outward position. The turning inwards of the vanes 4 to load up the records to be played is effected by the short arm of the crescent shaped striker 11 which is given a turning movement in the appropriate direction through mechanism which is manually operated by the knob 17 mounted on the upper side of the motorboard.

The knob 17 is held in an intermediate rotary position by means of a ball catch so that it may be rotated either in a clockwise or anticlockwise direction.

The knob 17 is provided with a vertical pivot pin 45 which passes down through the motorboard and at its lower end is attached a segmental member 46 and an operating member 47. To effect the inward movement of the vanes when loading and assuming the knob is in its intermediate position then by turning it in an anticlockwise direction see Fig. 4, the members 46 and 47 will be rotated correspondingly. During this rotation the operating member 47 engages with a pin 48 projecting downwardly from the underside of one arm of a bell crank lever 49. The other arm of which is adapted to be engaged by a cam on the cam drum to effect automatic operation of this lever when unloading the magazine as mentioned later. This lever is pivotally mounted by one end to the motor casing, and as a consequence of the engagement of its pin 48 with the operating member 47 continued movement of this member causes the lever to turn about its pivot. Connected with one arm of the lever 49 is one end of a link 50 the other end of the link being connected to the oscillating lever 14. Thus when the lever 49 is turned about its pivot, the oscillating lever 14 is rotated by the link 50 this rotation being imparted to the rod 12 by the pin 16 and slot 15. When the knob is turned back to its original position the member 46 will engage the lever 49 and return it to its first position thereby setting the striker back in its original position in readiness for the next pair of vanes.

As both vanes 4 of a pair must be rotated in synchronism the movement of the lever 49 is transmitted to a further oscillating lever 14 associated with a further rod 12 on the other side of the turntable through a further link 51 one end of which is attached to the link 50, the other end being connected to a lever 52 which is pivotally mounted at its centre as indicated at 53. The other end of this pivoted lever is connected to one end of a link 54 the free end of which is coupled to the further oscillating lever 14.

By this means a turning movement is imparted simultaneously to each rod 12 effecting simultaneously inward movement of corresponding vanes in each column.

After each pair of vanes 4 is turned inwards the rods 12 have to be raised to bring the striker 11 into registration with the stem of the next pair of vanes.

This raising of each rod 12 is effected by levers 56 one being associated with each rod 12.

Each lever 56 is provided with a tooth shaped end 55 which is adapted to be brought into engagement with the teeth 13 of the associated rod 12 and when in engagement is given a lifting movement to raise the rod 12 the desired amount and finally to be withdrawn in readiness for the next lifting movement.

These movements are obtained by pivotally mounting the levers 56 by means of a pin and slot mounting 57 to brackets 58 which depend from the underside of the motor board, the pivotal mounting so provided permitting the lever to be moved to and fro to effect engagement and disengagement of the shaped end 55 with the teeth of the associated rod 12, whilst the same is free to simultaneously be turned in such a direction about this pivot to cause the shaped end to be raised or lowered.

The movements of each lever 56 are obtained through a pin and slot connection, the pin 58a

of which projects from the rear end of each lever 56, the slot being formed in a crank 59 attached so as to turn with a shaft 60. When the shaft 60 is rotated the cranks 59 move likewise and impart through the pin and slot connection a forward and upward motion of the shaped ends 55, and when rotated in the opposite direction the shaped ends 55 are moved outwards and downwards.

Rotation of the shaft 60 is effected by a further crank 61 which is connected to one end of a pull rod 62 the other end of such pull rod being coupled to a rocking lever 63 which is operated by a member 65 attached to pin 45 of the knob 17. Accordingly when the knob 17 is rotated the member 65 engages the lever 63 in advance of the engagement between 47 and 48 and such lever swings in a direction which causes the crank 61 to rotate thereby effecting the desired movements of the levers 56 through the shaft 60. A return spring is provided to return the shaft to its normal position when the knob 17 is turned so that the member 65 releases the lever 63.

In order that the rods 12 remain in a raised position, spring ratchets 64 are provided which engage the teeth of the rods and hold the same in each raised position.

All the above operations are effected manually by turning the knob 17 from its intermediate position in a clockwise direction, and when the limit of travel in this direction is reached the knob is turned in the opposite direction until it again reaches the intermediate position in readiness for a repetition of the above as loading continues.

When the magazine has been completely filled, the rods 12 are at their uppermost position, and they must therefore be returned to their lowermost position to bring the striker into registration with the stems of the lowermost pair of vanes 4 in readiness to operate them to release a record to be positioned on the turntable.

This downward movement of the rods is effected by turning the knob 17 from its intermediate position past the ball catch in a clockwise direction, see Fig. 4. During this rotation of the knob the member 65 attached to the lower end of the pin 45 engages the end 66 of the rocking lever 63 such lever thereby again being operated to cause the shaft 60 to be rotated. The amount of rotation in this instance is sufficient to cause the levers 56 to turn about the pin 57 an amount sufficient to cause projections 55a on such levers to move downwardly and engage projection 64a of the ratchets 64 to depress the same and cause each ratchet to turn about its pivot 64b and disengage from the teeth of the rods 12.

The above pivoted movement of the levers 56 is sufficient to cause the members 55 on the levers 56 to disengage with the teeth of the rods 12 such disengagement being simultaneous with the above disengagement of the ratchets.

During playing unloading of the magazine is effected automatically and for this purpose the rotary movement and also the upward movement of the rods 12 are effected by cams on the cam drum 41.

The automatic rotary movement of the rods 12 is obtained by a cam, not shown, on the cam drum 41 which cam engages the free arm of the bell crank lever 49 and moves the same in such a direction that the other arm swings in the correct direction to impart the desired rotary movement to the rods 12 through the associated pull rods and levers.

Pull springs are provided to return the various parts to their normal position when the cam releases the arm of the bell crank lever 49.

The step by step upward movement of the rods 12 is obtained as before through the shaft 60, rotation of which in the desired direction is obtained through a crank 61a mounted on such shaft, the free end of this crank being connected to a pull rod 62a, the other end of which is coupled to one end of a rocking lever 63a. This rocking lever is pivotally mounted by its other end on the motor board and is engaged intermediate its length by a cam carried by the cam drum, engagement of the cam with this lever causing such lever to swing in a direction to impart through the pull rod 62a the required movement of the shaft 60.

Record reversing mechanism

The rotary movement of the swinging arm 3 is obtained as stated through the medium of a rack 20 pinion 22 and pull rod 21 sufficient vertical movement being imparted to the rack by means of a lever 23 to rotate the arm 3 through 180°.

To effect this vertical motion the lever 23 is attached to one arm of a bell crank lever which is pivotally mounted, in a suitable bearing, on the underside of the motorboard.

The other arm of the bell crank lever is coupled to a pull rod 67 the other end of the pull rod being attached to a rocking lever 68 which is operated by a cam on the cam drum.

The operation of the pull rod 26 which imparts through the arm 27, swinging movement to the arm 3, is effected by coupling the free end of the pull rod to one end of a rocking lever 69 which is pivotally mounted at its other end on the motor board and is engageable intermediate its length by a cam carried by the cam drum.

Retraction of the portion 30 of the gripper is effected as stated previously by the downward movement of the spindle 34, this movement being obtained by the operation of the bell crank lever 35 one arm of which engages with the lower end of the spindle 34.

The movement of the bell crank lever 35 is obtained through the medium of a pull rod 70 one end of which is connected to the other arm of the bell crank lever whilst the other end of the pull rod is coupled to a rocking lever 71 adapted to be operated by an associated cam carried by the cam drum.

Record raising mechanism

The rests 37 are attached to the upper ends of vertical spindles 72 which spindles pass through the motorboard. To raise the rests these spindles are lifted, and this is effected by arms 72a which are adapted to engage the lower ends of the spindles 72. The arms 72a are attached to the shaft 60 so that as this shaft is rotated the outer end of the arms travel upwardly in an arc and in their travel engage the lower ends of the spindles 72 thereby lifting the same, lowering being effected by reverse rotation of the shaft.

Pick-up operating mechanism

The pick-up or tone arm is mounted in bearings on a standard and is adapted to be swung into and out of engagement with a positioned record.

To effect this operation, the pick up is attached to the upper end of a vertical spindle 73.

This spindle passes through the motorboard,

and has attached, rigidly to its lower end, a short arm 74 which co-acts with a rocking lever 75 pivotally mounted on the motorboard, said rocking lever being engaged by a cam intermediate its length, so as to effect movement of the tone arm outwardly and clear of a positioned record.

The inward motion of the pick-up or tone arm is effected by a spring 76 which is tensioned when the said arm is swung out of engagement. One end of this spring is anchored to the motorboard whilst the other end is attached to a rocking lever 77 pivotally mounted by one end at 78 on the motorboard.

Normally this lever 77 is held in a retracted position by a co-operating cam surface on the cam drum, but when the pick-up or tone arm is to be brought into engagement with a positioned record, the lever leaves the cam surface and is pulled by the spring into a cam slot provided for the purpose in the drum as it rotates.

This causes the end 79 of this lever to move to the left (see Fig. 4) and this in turn imparts a sliding motion, in a similar direction, to a further lever 80, one end of which is attached to the end 79 of the lever 78, whilst the other end is attached to a crank 81 pivotally mounted on the motorboard.

The sliding motion of the lever 80 is translated into a rotary movement of the pick-up or tone arm through a short arm 82 which although not shown on the drawing is attached to the lower end of the vertical spindle 73, the arm being caused to turn in the appropriate direction through the medium of a pin 83 projecting down from the arm and engaging a hook shaped projection 83a formed on the sliding lever 80.

To vary the position of the projection 83 on the lever 80 to accommodate records of various sizes the pivot pin of the crank 81 has attached to it a further crank which is operated to rotate the crank 81 and thereby position the sliding lever 80, by the gauging arm 39. The upper end of this gauging arm projects above the motorboard and is provided with a pad which engages the record edge and thus "feels" the size of a positioned record.

The lower end of the gauging arm projects below the motor board and is coupled, as above stated, by a lever to the crank pivot pin of the crank 81.

By this means the position of the gauging arm determines automatically the amount by which the pick-up is swung into the playing position. This arm is adapted to be swung clear of the record edge during playing.

To permit the pick-up or sound box on the outer end of the pick-up or tone arm to be raised from the playing surface of the record this arm is given a vertical movement as well as a horizontal swinging movement for which purpose the arm is mounted in horizontal pivots.

The raising movement is effected by imparting a downward movement to the vertical spindle 73 the upper end of which is attached as stated to the arm near its rear end.

The downward motion of the vertical spindle 73 is effected by a bell crank lever 84 which is pivotally mounted on the motor board, one arm being forked to engage a collar or shoulder 85 attached to or forming part of the lower end of the spindle 73. When the bell crank 84 is turned about its pivot the forked arm engages the collar or shoulder and forces it in a downward direction, a similar motion therefore being imparted to the vertical spindle.

The turning movement of the bell crank lever 84 is effected by a rocking lever 86, one end of which is pivotally mounted on the underside of the motor board, the other end engaging the free arm of the bell crank lever. The rocking lever is operated by an associated cam which engages one end of said lever the cam being carried by the aforesaid cam drum. The pick-up is lowered onto the record surface at the appropriate time by gravity as the cam releases the rocking lever 86.

What I claim is:

1. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for swinging movement in a horizontal plane thereabove, and a turning movement about an axis extending in its own plane, and a record engaging member on the arm means operatively connected with the arm and record engaging member, and respectively actuable after a record on the turntable has been played on one side, to swing the arm towards and to a position above the turntable, to actuate the record engaging member on the arm for engagement with the played record, to swing the arm carrying the engaged record away from the turntable, to turn the arm about its axis to reverse the engaged record, to swing the arm carrying the reversed record to return the same to a position above the turntable, and to release the record engaging member on the arm from engagement with the reversed record for deposit onto the turntable for further playing.

2. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for a swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a gripper carried on the arm, and means operatively connected with the arm and gripper and respectively actuable after a record on the turntable has been played on one side, to swing the arm towards and to a position above the turntable, to actuate the gripper on the arm for engaging the record, to swing the arm carrying the engaged record away from the turntable, to turn the arm carrying the engaged record about its axis for reversing the record, to swing the arm carrying the reversed record to return the same to a position above the turntable, and to release the gripper from engagement with the reversed record for deposit onto the turntable for further playing.

3. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for a swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a record engaging member on the arm, an elevator mounted adjacent the turntable for raising and lowering movement, and means operatively connected with the arm, record engaging member and the elevator, and respectively actuable after a record on the turntable has been played on one side, to raise the elevator to lift the played record from the turntable, and support the same in a position thereabove, to swing the record engaging arm towards and to a position above the turntable, to actuate the arm for engagement with the supported record, to swing the arm carrying the engaged record away from the turntable, to turn the arm about its axis for reversing the engaged record, to swing the arm carrying the reversed record to a position above the turntable, and

to release the record engaging member on the arm from engagement with the reversed record for deposit onto the turntable for further playing.

4. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a gripper carried on the arm, an elevator mounted adjacent the turntable for raising and lowering movement, and means operatively connected with the arm, the gripper, and the elevator, after a record on the turntable has been played on one side and respectively actuable, to raise the elevator to lift the played record from the turntable, to a position thereabove, to swing the arm towards and to a position above the turntable, to actuate the gripper for engaging the lifted record, to swing the arm carrying the engaged record away from the turntable, to turn the arm about its axis for reversing the engaged record, to swing the arm carrying the reversed record to return the same to a position above the turntable, and to release the gripper from engagement with the reversed record for depositing the same onto the turntable for further playing.

5. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for movement towards and away from the turntable and for a turning movement about an axis extending in a horizontal plane thereabove, a record engaging member on the arm, an elevator mounted adjacent the periphery of the turntable for raising and lowering movement, and means operatively connected with the arm, record engaging member and elevator after a record on the turntable has been played on one side, and respectively actuable to raise the elevator to lift the played record from the turntable and support the same at a position thereabove, to move the arm under the record supported on the elevator, to lower the elevator to deposit the supported record onto the arm, to actuate the record engaging member on the arm for engagement with the record to turn the arm carrying the deposited record about its axis to reverse the record, and to release the record engaging member on arm from engagement with the reversed record for deposit onto the turntable for further playing.

6. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for movement towards and away from the turntable and for a turning movement about an axis extending in a horizontal plane thereabove, a record gripper carried on the arm, an elevator mounted adjacent the periphery of the turntable, for raising and lowering movement, and means operatively connected with the arm, the gripper, and the elevator after a record on the turntable has been played on one side; and respectively actuable to raise the elevator to lift the played record from the turntable and support the same at a position thereabove, to move the arm under the record supported on the elevator, to lower the elevator to deposit the supported record onto the arm, to actuate the gripper to engage the record deposited on the arm, to turn the arm carrying the gripped record about its axis to reverse the record, and to release the gripper from engagement with the record to deposit the released record onto the turntable for further playing.

7. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for a swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a record engaging member on the arm, an elevator mounted for raising and lowering movement, and means operatively connected with the arm, record engaging member and elevator after a record on the turntable has been played on one side; and respectively actuable to raise the elevator to lift the record from the turntable and support the same at a position thereabove, to swing the arm under the record supported on the elevator, to lower the elevator to deposit the record onto the arm, to actuate the record engaging member on the arm for engagement with the record to swing the arm carrying the deposited and engaged record away from the turntable, to turn the arm about its axis to reverse the record, to swing the arm carrying the reversed record to return the same to a position above the turntable and to release the record engaging member on the arm from engagement with the reversed record for deposit onto the turntable for further playing.

8. In a gramophone having a turntable adapted to carry a disk record in combination, an arm mounted adjacent the turntable for a swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a gripper carried on the arm, an elevator mounted for raising and lowering movement, and means operatively connected with the arm, the gripper, and the elevator after a record on the turntable has been played on one side; and respectively actuable to raise the elevator to lift the played record from the turntable and support the same at a position thereabove, to swing the arm under the record supported on the elevator, to lower the elevator, to deposit the record onto the arm, to actuate the gripper for engaging the deposited record on the arm, to swing the arm carrying the engaged record away from the turntable, to turn the arm about its axis for reversing the record, to swing the arm carrying the reversed record to return the same to a position above the turntable, and to release the gripper from engagement with the reversed record for deposit onto the turntable for further playing.

9. In a gramophone having a turntable adapted to carry a disk record, in combination, an arm mounted adjacent the turntable for a swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a record engaging member on the arm, an elevator mounted for raising and lowering movement, and means operatively connected with the arm record engaging member and elevator and respectively actuable after a record on the turntable has been played on one side; to raise the elevator to lift the record from the turntable and support the same at a position thereabove, to swing the arm under the record supported on the elevator, to lower the elevator to deposit the record onto the arm, to actuate the record engaging member on the arm for engagement with the deposited record to swing the arm carrying the deposited and engaged record away from the turntable, to turn the arm about its axis to reverse the record,

to swing the arm carrying the reversed record to return the same to a position above the turntable, and to release the record engaging member on the arm from engagement with the reversed record for deposit onto the turntable for further playing; and a control member operatively connected with the aforesaid means for cyclically actuating the same.

10. In a gramophone having a turntable adapted to carry a disk record in combination, an arm mounted adjacent the turntable for a swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a gripper carried on the arm, an elevator mounted for raising and lowering movement, and means operatively connected with the arm, gripper and elevator and respectively actuable by the control member after a record on the turntable has been played on one side, to raise the elevator to lift the played record from the turntable and support the same at a position thereabove, to swing the arm under the record supported on the elevator, to lower the elevator, to deposit the record onto the arm, to actuate the gripper for engaging the deposited record on the arm, to swing the arm carrying the engaged record away from the turntable, to turn the arm about its axis for reversing the record, to swing the arm carrying the reversed record to return the same to a position above the turntable, to release the gripper from engagement with the reversed record for deposit onto the turntable for further playing.

11. In a gramophone having a turntable adapted to carry a disk record in combination, an arm mounted adjacent the turntable for a swinging movement in a horizontal plane thereabove and a turning movement about an axis extending in its own plane, a gripper carried on the arm, an elevator mounted for raising and lowering movement, and means operatively connected with the arm, gripper and elevator and respectively actuable after a record on the turntable has been played on one side, to raise the elevator to lift the played record from the turntable and support the same at a position thereabove, to swing the arm under the record supported on the elevator, to lower the elevator, to deposit the record onto the arm, to actuate the gripper for engaging the deposited record on the arm, to swing the arm carrying the engaged record away from the turntable, to turn the arm about its axis for reversing the record, to swing the arm carrying the reversed record to return the same to a position above the turntable, to release the gripper from engagement with the reversed record for deposit onto the turntable for further playing; said means being further actuable after the record on the turntable has been played on the reversed side; to raise the elevator to lift the thus played record and support the same under the arm, to actuate the gripper for engaging the thus supported record, to swing the arm carrying the thus played record away from the turntable, and to release the gripper from engagement with the record for rejection.

ARTHUR ROBERT DOWNS.