H. T. SCOTT & L. J. PATTERSON.

AUTOMATIC PHONOGRAPH.

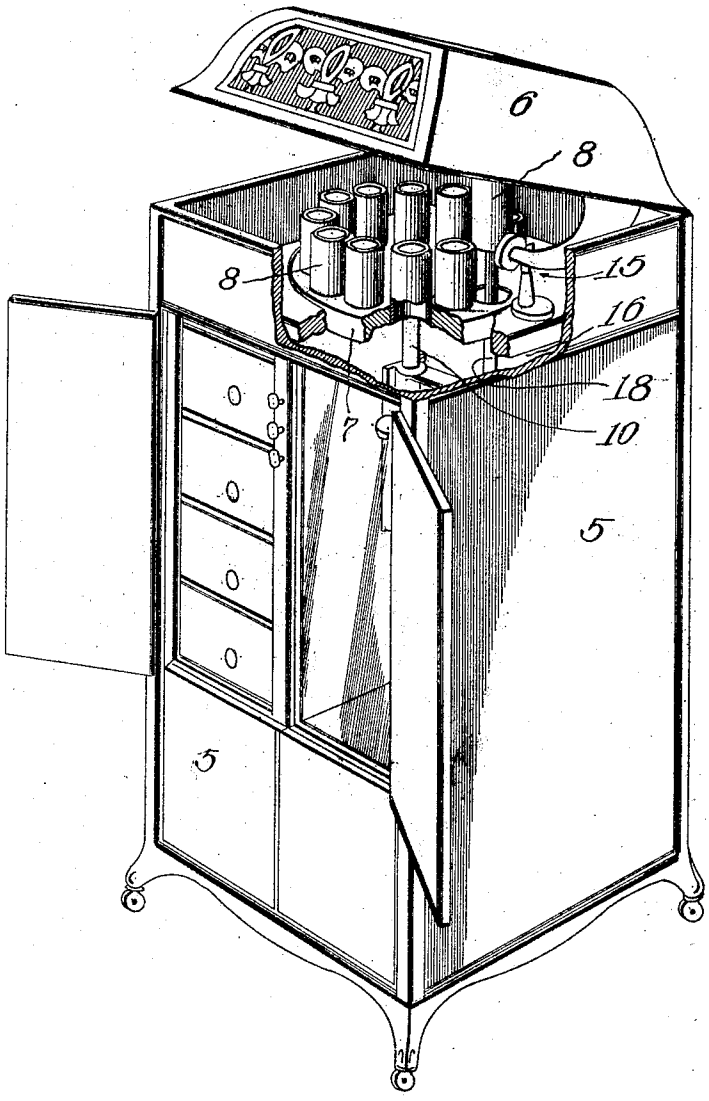
APPLICATION FILED AUG. 15, 1911.

1,040,031.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 1.

Fig. 1.



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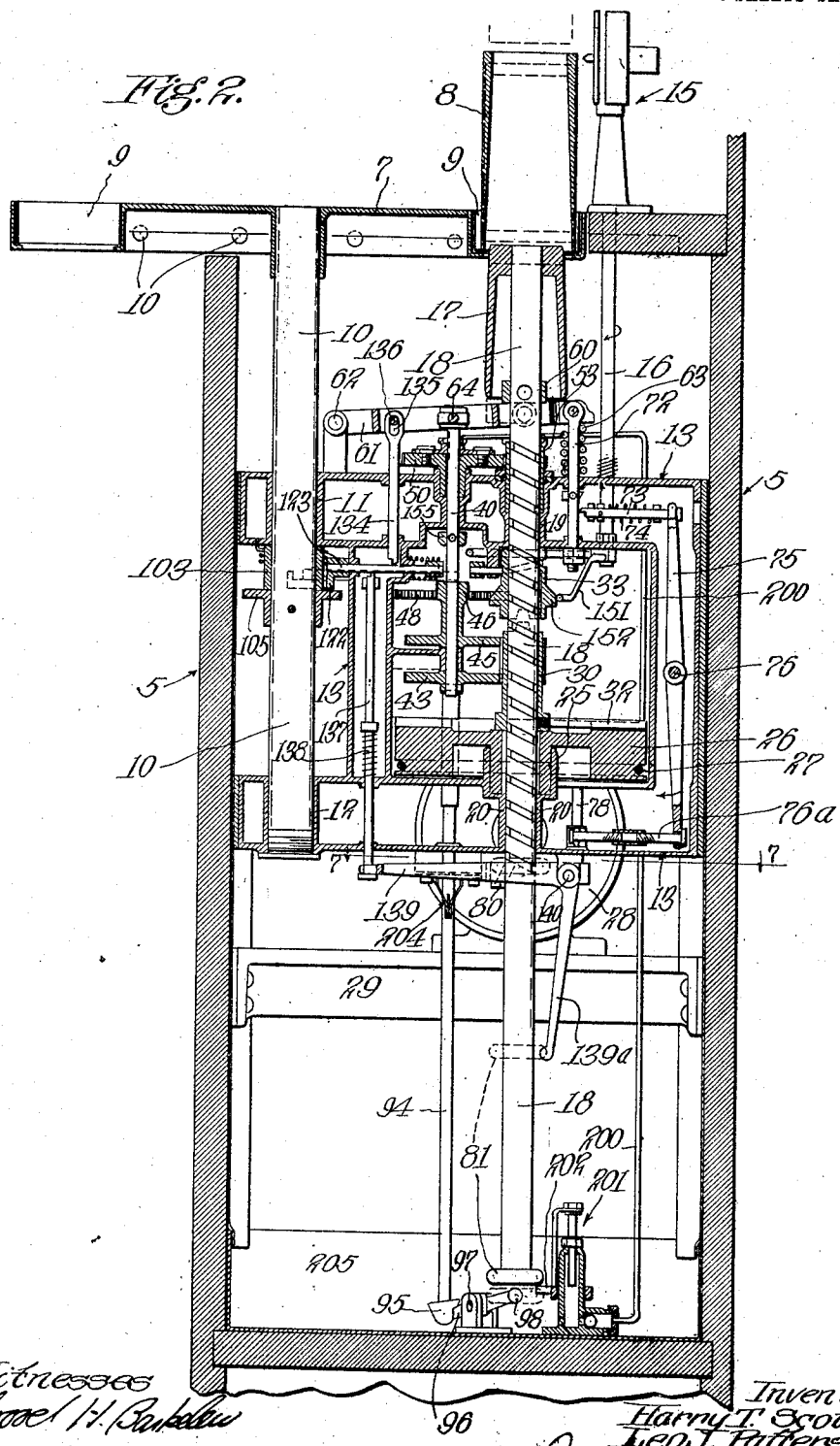
6 SHEETS—SHEET 2.

Fig. 2.



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6 SHEETS—SHEET 3.

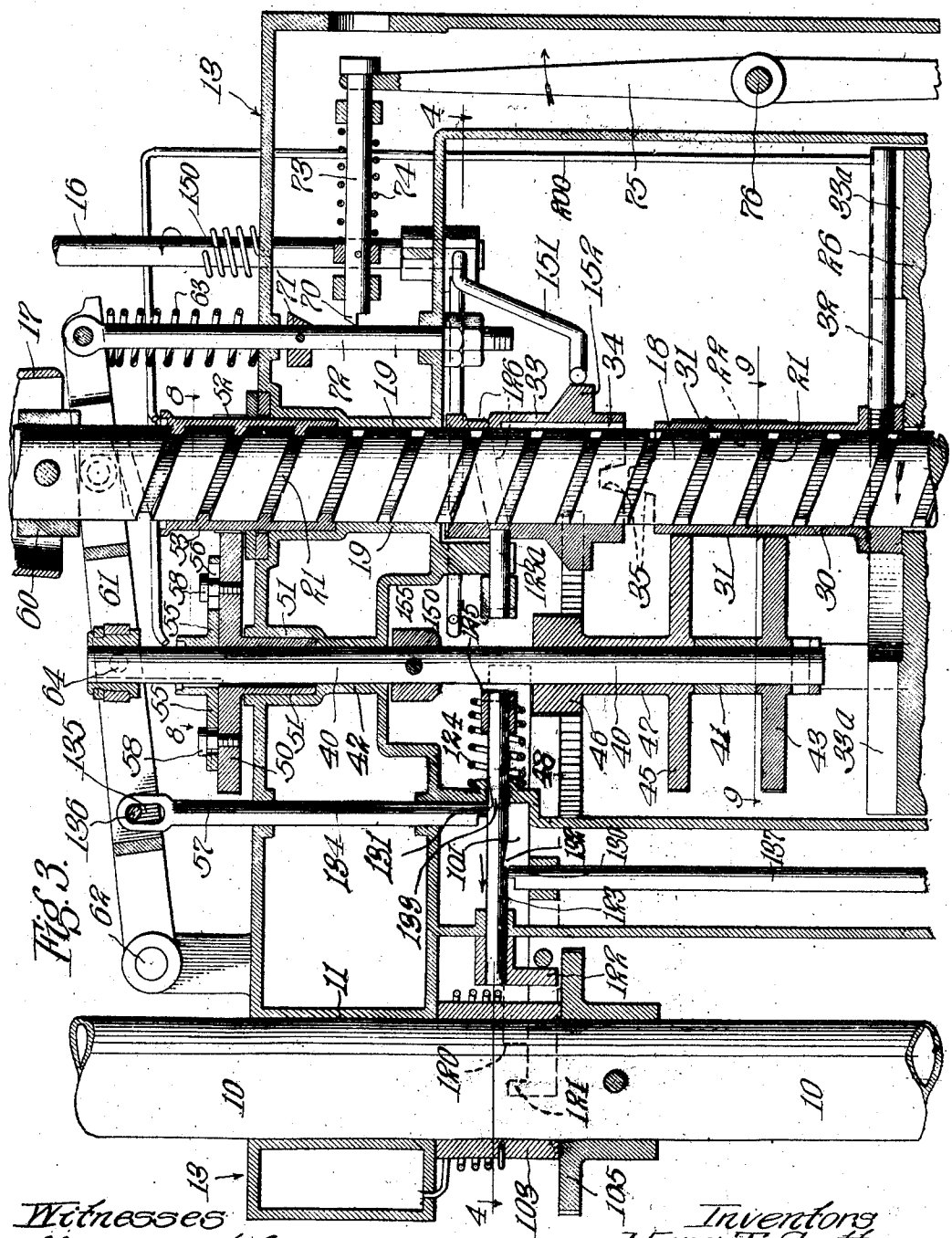

Fig. 3.

Witnesses

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6 SHEETS—SHEET 4.

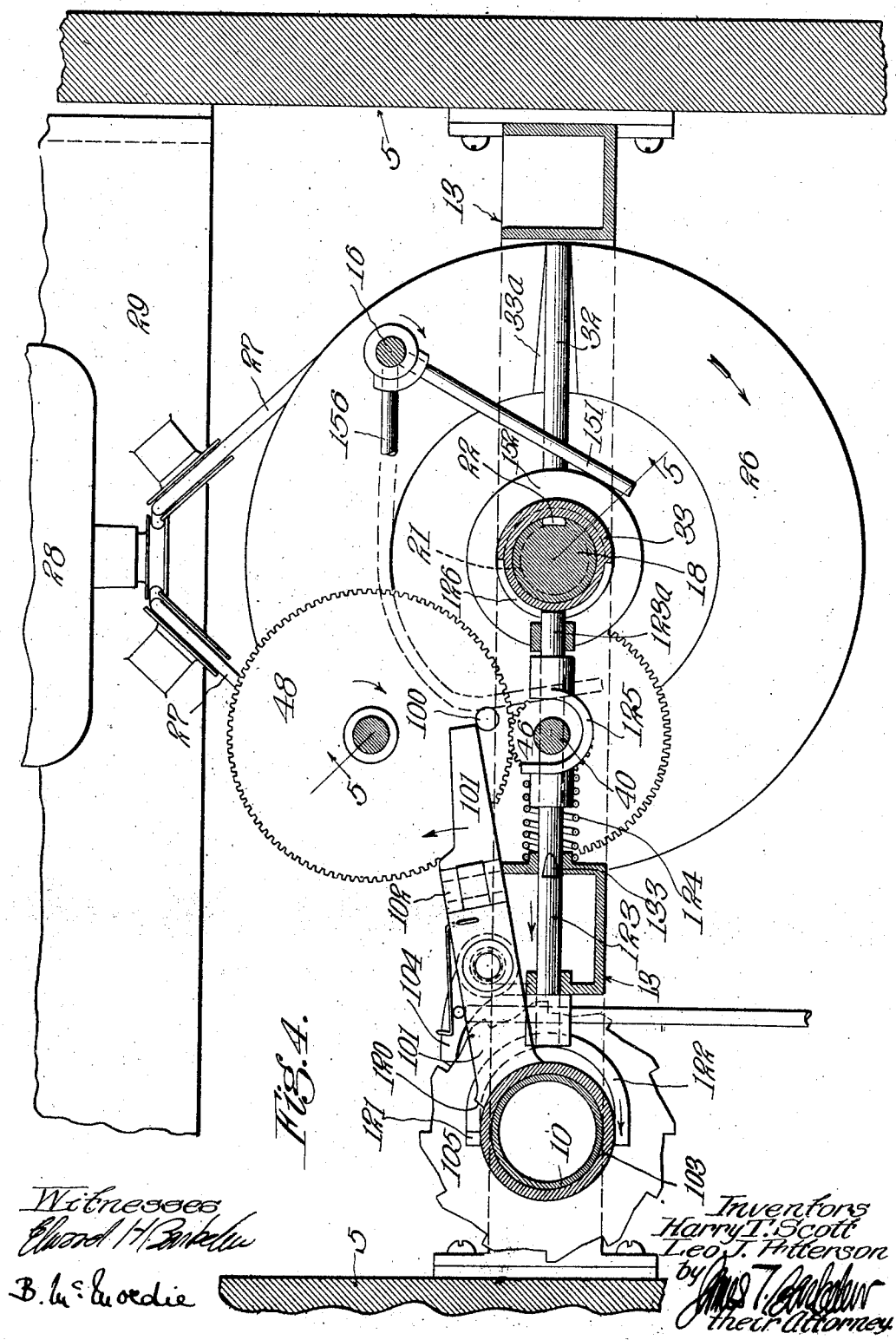

Fig. 4.

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6 SHEETS—SHEET 5.

Fig. 5.

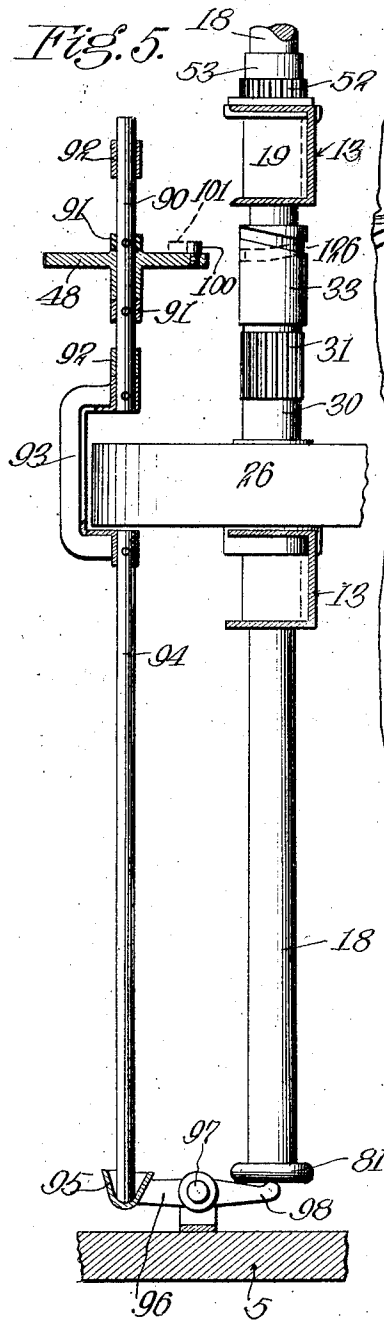
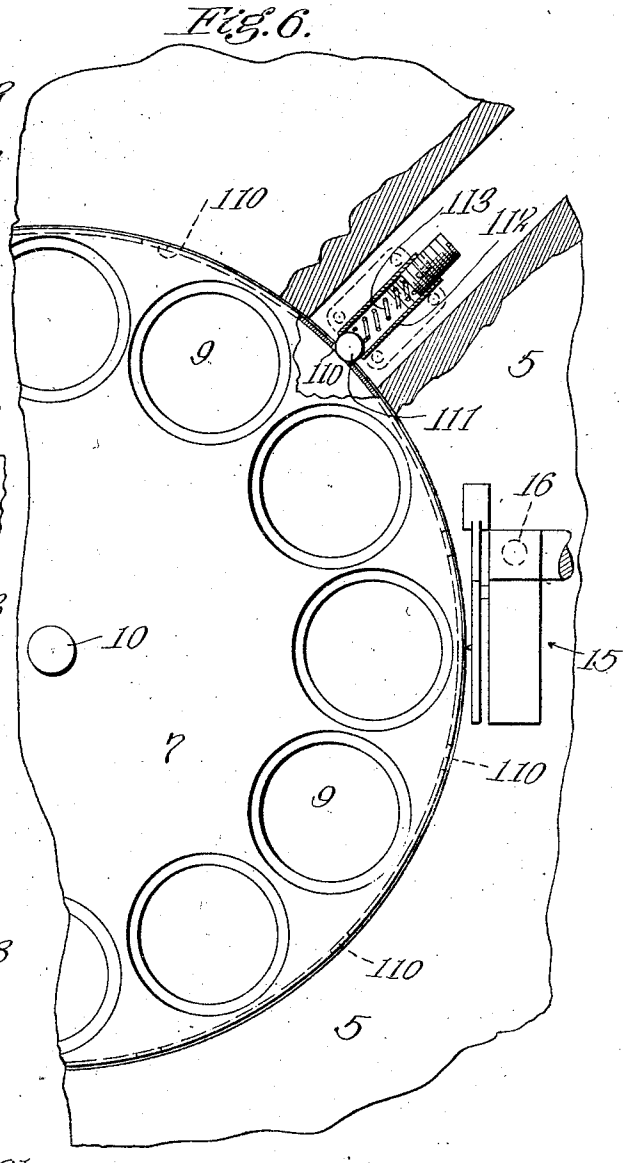


Fig. 6.



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AUTOMATIC PHONOGRAPH.

APPLICATION FILED AUG. 15, 1911.

1,040,031.

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6 SHEETS—SHEET 6.

Fig. 7.

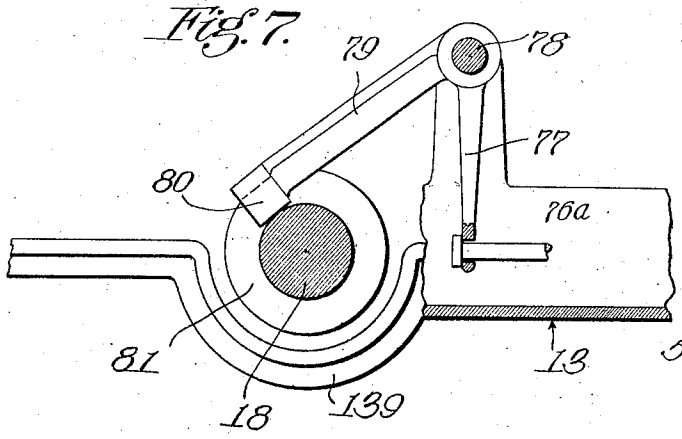


Fig. 10.

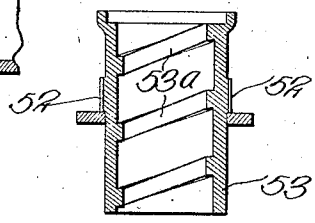


Fig. 8.

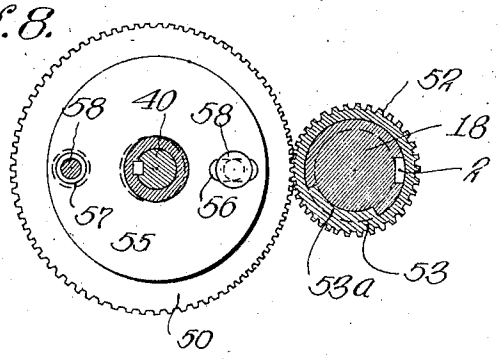
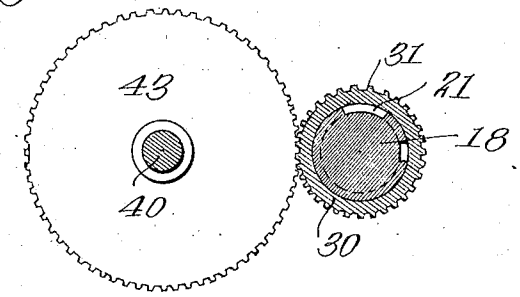


Fig. 9.



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UNITED STATES PATENT OFFICE.

HARRY T. SCOTT AND LEO J. PATTERSON, OF LOS ANGELES, CALIFORNIA; SAID PATTERSON ASSIGNOR TO SAID SCOTT.

AUTOMATIC PHONOGRAPH.

1,040,031. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed August 15, 1911. Serial No. 644,196.

To all whom it may concern:

Be it known that we, HARRY T. SCOTT and LEO J. PATTERSON, citizens of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Automatic Phonographs, of which the following is a specification.

This invention relates to improvements in our former devices, set forth in our applications Serial Nos. 605,881 and 629,892, filed February 1st, 1911 and May 27th, 1911, respectively, and particularly to a novel mode of securing the motion of the record carrying mandrel.

Whereas in both our former inventions there has been utilized a screw feed for the mandrel shaft, with various appurtenances for controlling this feed, in the present machine we provide for feeding the mandrel shaft by differential screw action on the shaft itself. As will be seen from the following specification, the mechanism for accomplishing this feeding action is very simple in its elements and combination, and each of the elements is of such design that the machine is less liable to wear, particularly having no small wearing parts.

In the invention as now constituted, there is first provided a mandrel shaft situated in vertical bearings so as to be rotatable and longitudinally translatable, a suitable screw thread being cut on the outside of the mandrel shaft. A rotatable nut engages with the shaft thread so that, by rotation of this nut, the shaft may be either raised or lowered, according to the direction of rotation. Means are provided for rotating the nut and the shaft at differential speeds, and for stopping and starting the rotation of the nut and shaft at different points in the operation of the machine. The direction of the mandrel screw thread in the present machine is such that, to feed the mandrel shaft downwardly by the differential action, the nut must be rotated slightly faster than the shaft itself; but it will be seen that, by suitable arrangements, this differential action might be exactly reversed. For driving the nut a simple gear mechanism is provided connecting the nut with a sleeve rotating about the shaft. This sleeve is loosely mounted on the shaft and is rotatably connectible to the shaft through the means of another sleeve loosely keyed to the shaft and slidable thereon, the two sleeves having co-engaging means which may be slid into or out of engagement. The gears connect the first-mentioned sleeve with the nut in such manner that the nut travels slightly faster than the sleeves; and arrangements are made for shifting these gears so as to throw them out of mesh and stop the rotation of the nut entirely. The sleeve rotates constantly, being driven directly from the fly-wheel of the machine which is driven by a suitable motor.

The nut and shaft rotate in the same direction; so that it will be seen that, if the arrangement is such that when the nut alone is revolving the shaft is moved downwardly, when the shaft alone revolves in the same direction it will be moved upwardly. The rate of these movements will depend entirely upon the speed of rotation of the nut and shaft and the pitch of the screw thread; and the pitch is made sufficiently coarse to cause the movement of the shaft at a comparatively high speed when either the nut or the shaft is rotated alone. But when the nut and shaft are rotated together, the differential action causes the slow downward movement of the shaft while it is rotated; and it is during this movement that the reproducing mechanism is thrown into engagement with the record to follow its sound groove. Thus, considered in a broad manner, the operation of the device is as follows: Mechanism controlled by the shaft when in its lowermost position causes the shaft to begin rotating. This immediately screws the shaft upwardly until it reaches its uppermost position. Mechanism controlled by the position of the shaft at its uppermost point causes the nut to begin revolving and the shaft is then moved down differentially while it is rotated. When the shaft has moved downwardly through a portion of its downward motion and the record on the mandrel has completely passed by the reproducing mechanism, mechanism is engaged by the shaft to stop the rotation of the shaft, the nut alone continuing in rotation. This causes the quick downward motion of the shaft to its original positon. Means are

also provided for automatically feeding the record carrying table and for moving the reproducer into and out of engagement with a record; but these means do not enter broadly into the combination, entering only specifically when the mechanical details are considered.

In the accompanying drawings: Figure 1 is a perspective view showing the arrangement of the improved machine in a case. Fig. 2 is a vertical central section of the entire mechanism. Fig. 3 is an enlargement of certain portions shown in Fig. 2. Fig. 4 is a horizontal cross section taken on line 4—4 of Fig. 3. Fig. 5 is a vertical section taken on line 5—5 of Fig. 4. Fig. 6 is a segmental plan view, with parts in section, showing the arrangement of the top of the record carrying table and the registering means therefor. Fig. 7 is an enlarged fragmentary section taken on line 7—7 of Fig. 2. Fig. 8 is a horizontal section taken on line 8—8 of Fig. 3. Fig. 9 is a horizontal section taken on line 9—9 of Fig. 3. Fig. 10 is a central vertical section of the nut which engages the screw thread of the mandrel shaft.

In the drawings 5 designates a suitable case having a cover 6 beneath which record carrying table 7 is mounted, record 8 being placed in pocket 9 as in the devices of the former applications above referred to. This record carrying table is mounted on an upright table shaft 10 which is mounted in bearings 11 and 12 in main frame 13 of the machine. Frame 13 is of the general rectangular form illustrated in Fig. 2 and is secured to the case 5 in any suitable manner. Shaft 10 is so mounted that it is freely revoluble about its vertical axis to turn the table to present any particular record opposite the reproducing mechanism 15. This reproducing mechanism is mounted on a vertical shaft 16 in such a manner that the turning of the shaft will cause the movement of the mechanism toward or away from a record 8 carried on mandrel 17 of the machine. Mandrel 17 is mounted on the upper end of mandrel shaft 18 mounted in bearings 19 and 20 in frame 13. This mandrel shaft is revoluble and vertically movable along its longitudinal vertical axis and is provided with a screw thread 21 throughout a considerable portion of its length. It also is provided with a key-way 22.

Mounted around mandrel shaft 18 and situated in a bearing 25 in the lower part of frame 13 is a fly-wheel 26. This fly-wheel is driven by any suitable means, such as a belt 27 from a small motor 28 mounted on a heavy frame 29 which extends across the case and is of such weight as to efficiently absorb any of the motor vibrations and thus reduce to a minimum all noise within the case. Fly-wheel 26 has no direct rotational connection with mandrel shaft 18; it is merely placed around the shaft on account of the convenience of this location. Situated directly above the fly-wheel 26 is a sleeve 30, loosely engaging the shaft and having gear teeth 31 thereon. This sleeve 30 is driven through the medium of an arm 32 which engages a notch 33ª in the fly-wheel, the sleeve and gear teeth being thus driven directly with the fly-wheel. This sleeve has no direct rotational connection with the shaft, its connection with the shaft being through the medium of another sleeve 33 provided with a key 34 which engages in key-way 22 of mandrel shaft 18, the two sleeves being provided with co-engaging means 35 causing the revolution of sleeve 33 from sleeve 30. In the position shown in the drawings sleeve 33 is shown in its upper position so that it does not engage at all with sleeve 30. In this position the sleeve 33 and the mandrel shaft will not be rotated, sleeve 30 rotating alone. The means for raising sleeve 33 and for allowing it to drop into engagement with sleeve 30 will be hereinafter explained.

Located alongside mandrel shaft 18 is a counter shaft 40 mounted in suitable bearings 41 and 42. This shaft is both rotatable and slidable and carries on its lower end a gear 43 which engages with gear teeth 31 of sleeve 30 when gear 43 is in its upper position; but when the gear 43 is moved downwardly it will move out of engagement with gear teeth 31 and the rotation of gear 43 and shaft 40 will cease. Directly above bearing 41 a large and small gear 45 and 46 are mounted together on a sleeve 47 loosely mounted on shaft 40. Gear 45 also meshes with teeth 31 of sleeve 30 and gear 46 drives a gear 48 which is a portion of the mechanism for automatically feeding the record carrying table. This mechanism will be later explained. Above bearing 42 of shaft 40 another gear 50 is mounted in an independent bearing 51. Gear 50 is not of the same diameter and number of teeth as gear 43, being, in this case, of slightly larger diameter and having a larger number of teeth. This gear 50 meshes with gear teeth 52 on nut 53; and the diameter of teeth 52 being the same as that of teeth 31, it follows that the center of gear 50 will be slightly farther from the center of mandrel shaft 18 than is the center of gear 43. Thus, as gear 43 is directly mounted on shaft 40, the center of gear 50 must be set slightly eccentric to the center of shaft 40, and this is most conveniently done by providing the gear 50 with an independent bearing. The driving means provided between the gear 50 and the shaft 40 are shown particularly in Figs. 3 and 8. A disk 55 is slidably keyed to shaft 40 (so as to allow the longitudinal movement of the shaft, as will be hereinafter explained) and this disk is provided

with a slot and a hole 56 and 57 and with which pins 58 engage, the pins being rigidly mounted on gear 50. The slot 56 and hole 57 provide accommodation for the eccentric movement of the gear and the disk while they also provide for the driving of the gear from the disk in a practically uniform manner. It will be understood that this arrangement is only one of several possible arrangements for obtaining a differential drive between sleeve 30 and nut 53. In the present instance, it is desired during the differential movement of the shaft to move it downwardly $\frac{1}{200}$ of an inch for each revolution. The screw thread 21 in the shaft has a one-half inch pitch, so that nut 53 is necessarily rotated $\frac{1}{100}$ times faster than sleeve 30 and shaft 18. If the pitch of the thread in the mandrel shaft be changed, then the differential speed between the sleeve and nut may be changed. This differential speed rests entirely on the proportioning of the connecting gears; and it is conceivable that the sizes of the four different gears might be so arranged with suitable numbers of teeth so that gear 50 could be directly mounted on shaft 40. In this case it would probably be difficult to obtain a differential speed of $\frac{1}{100}$ but, taking for instance that a differential speed of $\frac{1}{25}$ could be easily obtained, the screw thread in the mandrel shaft could be so pitched that the shaft would be moved downwardly $\frac{1}{200}$ of an inch for each revolution thereof. It is only on account of convenience as to size of gears and as to pitch of the screw thread that the present arrangement is adopted.

The means for sliding the counter shaft 40 is comprised in a leverage mechanism arranged above frame 13 and operated by a collar 60 secured on the mandrel shaft immediately below record mandrel 17. Collar 60 on reaching the position shown in the drawings contacts with lever 61 which is pivoted at 62 to the frame. Lever 61 is normally supported in the position shown by a spring 63. The upper end of shaft 40 is pivotally connected at 64 to lever 61 so that, when the lever is moved downwardly, the shaft will be moved downwardly to move gear 43 out of engagement with gear teeth 31. When this movement has been accomplished, the lever 61 is held in its lowermost position against the pressure of spring 63 by means of a catch 70 which engages over the upper surface of a collar 71 on a rod 72 attached to the end of lever 61. Catch 70 is formed on the end of a sliding rod 73 pressed by a spring 74 into engagement with rod 72 and collar 71. A lever 75 pivoted at 76 to frame 13 provides means for pulling catch 70 back out of engagement with collar 71 and for allowing spring 63 to then move lever 61 and shaft 40 upwardly to the position shown in Fig. 3. This lever 75 extends downwardly as is shown in Fig. 2 and is connected by an adjustable connecting rod 76ª to a short arm 77 mounted on an upright shaft 78. This is shown in detail in Fig. 7. Also mounted on shaft 78 is an arm 79 having a member 80 on its end with which a collar 81 mounted on the lower end of mandrel shaft 18 is adapted to engage when the mandrel shaft is in its uppermost position. When the mandrel shaft reaches this uppermost position this collar 81 engages with member 80 and pushes it away from the shaft in the direction indicated in Fig. 7. This rotates arm 77, and moves connecting rod 76 longitudinally, causing the movement of lever 75 in the direction indicated in Figs. 2 and 3. This causes the withdrawal of catch 70 and allows shaft 40 and gear 43 to move upwardly under the impulse of spring 63. This again places gear 43 in engagement with gear teeth 31 of sleeve 30.

As before explained, gear 48 is driven from gear 46, gear 46 being of sufficient width to mesh with gear 48 when the gear 48 is raised from the position shown through a distance about equal to its own width. Gear 48 is loosely mounted on a slidable shaft 90 between two collars 91, so that the gear may revolve on the shaft and may be raised and lowered by moving the shaft vertically. This shaft is mounted in suitable bearings 92 and is raised by the mechanism about to be described, being lowered by its own weight. A yoke 93 is attached to the lower end of shaft 90, this yoke being for the purpose of passing around the edge of fly-wheel 26, and the lower end of the yoke is again attached to a rod 94 which passes downwardly to the lower part of the mechanism and rests in a cup 95 on the end of a small lever 96 pivoted at 97 to a bracket which rests on the case 5. The other end 98 of the lever is in the position to be pressed downwardly by the lower end of mandrel shaft 18 when the mandrel shaft reaches its lowermost position, so that rod 94 and shaft 90 and gear 48 are moved upwardly when the mandrel shaft reaches its lowermost position, as is shown in Fig. 5. Mounted on the upper face of gear 48 is a driving pin 100. A ratchet arm 101 projects over the upper face of gear 48 and is adapted to be moved in the direction indicated in Fig. 4 when engaged by the driving pin 100. The ratchet arm can only be engaged by the pin when the gear 48 is in its uppermost position, for when the gear 48 is lowered the driving pin 100 will pass beneath the ratchet arm. The ratchet arm is hinged at 102 so that its end may rise when pin 100 should happen to be raised directly under the end of the arm, thus obviating any liability of breakage of any parts. Ratchet arm 101 is provided with a sleeve 103 which loosely en-

circles table shaft 10 directly below bearing 11. A pawl 104 pivotally mounted on ratchet arm 101 engages with the teeth of ratchet wheel 105 rigidly mounted on shaft 10. The number of teeth in ratchet wheel 105 corresponds to the number of record pockets in the record carrying table; and the arrangement is such that the pin 100 imparts to arm 101 a sufficient movement to move the record carrying table through the distance corresponding to the distance between adjacent record pockets, bringing successive records opposite the reproducing mechanism. The means for registering the table exactly in position after it has been fed through an appropriate portion of a revolution is shown particularly in Fig. 6. The rim of the table is provided with a plurality of properly spaced apertures 110 which are engageable by a spring pressed ball 111 mounted at a convenient point on case 5. The spring pressed ball is mounted in the end of a tube 112 and a spring 113 forces it resiliently into engagement with the apertures. When the table is fed, the engagement of the ball with an aperture is sufficient to stop the table exactly in position; while the resistance imposed is easily overcome by the force with which the ratchet mechanism operates.

On ratchet arm 101 there is arranged a shoulder 120 which engages with a lug 121 on a small frame 122 just as the ratchet arm passes through the last portion of its movement and just as the table is coming into its correct position. This causes the frame 122 to move in the direction indicated in Fig. 4 and causes a rod 123 to move in the same direction, this rod being attached to the frame 122. Rod 123 is normally pressed in the direction opposite to that indicated by a spring 124. A yoke member 125 serves to pass the connection of rod 123 around the counter shaft 40 and rod 123^a practically forms a continuation of rod 123 on the other side of the counter shaft. The end of this rod 123^a engages with a spiral groove 126 in the periphery of sleeve 33. This groove 126 is so made that, when rod 123^a is allowed to be spring pressed against the sleeve 33, the end of the rod will drop into the spiral groove and the rotation of the sleeve will then cause the sleeve to rise and to disengage the coengaging means 35 and thus to sever its rotational connection with sleeve 30. When this occurs, shaft 18 also ceases rotation as it is keyed to sleeve 33. Rod 123 is prevented from moving in the direction opposite to that indicated, in the direction to allow ends 123^a to engage with the spiral groove 126, by means of two detents 130 and 131 engaging with notches 132 and 133, respectively. Detent 131 is formed on the end of a rod 134 which is loosely connected through a slot and pin 135 and 136 with lever 61, so that, when lever 61 is in its lower position, the detent 131 may drop into notch 133 when the notch passes under the detent. Detent 130 is formed on the upper end of a rod 137 which is normally pressed upwardly by a spring 138, so that detent 130 will engage notch 132 whenever notch 132 passes above it. The lower end of rod 137 is connected to the end of a lever 139 pivoted at 140 to the under side of frame 13 and having a depending portion 139^a whose lower end is adapted to be engaged by collar 81 when the collar reaches the position shown in dotted lines in Fig. 2. The outward movement of end 139^a of the lever causes the downward movement of the end connected to rod 137 and pulls the rod downwardly against the pressure of spring 138 and releases detent 130 from notch 132.

Having described in the main the mechanism of the present machine, we will now proceed to describe its operation, adding the description of the few remaining parts as the description of the operation progresses. Starting with the mandrel shaft in the position shown, and moving downwardly, it will be seen that lever 61 will first be pressed downwardly, moving shaft 40 downwardly and moving gear 43 out of engagement with gear teeth 31. This will immediately stop the rotation of shaft 40 and will therefore stop the rotation of nut 53. Nut 53 has spiral ribs 53^a which engage with the screw thread of the shaft and the continued rotation of the shaft will cause its movement when the nut is stationary. But, with the machine in the position shown, the shaft is not rotated, the sleeve 33 having been raised out of engagement with the sleeve 30. Consequently, as soon as gear 43 is disengaged from gear teeth 31, the mandrel shaft will cease its downward motion. At the same time, when coming to its lowermost position, the lower end of the shaft engages with the end 98 of lever 96 and causes the upward movement of shaft 90 and gear 48. This causes feed pin 100 to come into contact with ratchet arm 101 which immediately causes the rotation of the record carrying table through, in this case, $\frac{1}{12}$ of a revolution. Just as the table comes to its final position, the rod 123 is drawn in the direction indicated in the manner hereinbefore explained. Arm 61 being in its lowermost position, detent 131 is allowed to drop into notch 133 and detent 130 is also forced up into notch 132 by the action of its spring 138. Rod 123^a is thus withdrawn from sleeve 33 and the sleeve allowed to drop and to engage with sleeve 30 which is constantly rotated. This immediately starts the rotation of shaft 18; but nut 53 is stationary, as gear 43 is still

in its lowermost position, being held in this position by the engagement of detent 70 with collar 71. The rotation of shaft 18 in the direction indicated thus causes the quick upward movement of the shaft. When the shaft reaches its uppermost position the detent 70 is withdrawn from collar 71 and the lever 61 is allowed to be moved upwardly under the pressure of spring 63. This immediately moves the gear 43 up into engagement with gear teeth 31, thus starting the rotation of nut 53. Nut 53 is rotated slightly faster than the shaft, so that the shaft is immediately fed downwardly by the differential action. At the same time the reproducer is let into engagement with the record carried by the mandrel 17 by a means which will be hereinafter explained. When the mandrel has moved downwardly through a distance corresponding to the length of the sound groove portion of the record, and has carried all of the sound groove past the reproducing point of the reproducing mechanism, then the collar 81 on the lower end of the shaft engages with the end 139[a] of lever 139 and causes the withdrawal of detent 130 from notch 132. Detent 131 having been previously withdrawn by the upward motion of lever 61, the rod 123[a] is allowed to move into engagement with spiral groove 126 and the rotation of sleeve then immediately raises it to the position shown in Fig. 3. The nut 53 continues to revolve and thus to force the shaft 18 downwardly until it reaches the position shown in Fig. 3, when the whole above described operation is repeated. The utility of detent 131 is this, that, on the upward movement of the mandrel shaft, the collar 81 will engage with the end 139[a] of lever 139 and will pull detent 130 out of engagement with its notch 132; but it is not desired to allow rod 123[a] to enter the spiral groove 126 at that time; and lever 61 being in its lowermost position while the shaft is moving upwardly, the detent 131 will then prevent the movement of rod 123[a] into the spiral groove. Detent 130 will immediately move back into its notch 132 when the collar 81 has passed the lever end 139[a] and will hold the rod 123[a] from movement into the spiral groove when detent 131 is withdrawn by the upward movement of lever 61 when the shaft reaches its uppermost position.

The means for moving the reproducing mechanism is comprised in a spring 150 which tends to rotate shaft 16 in the direction indicated and in a means for holding the shaft from rotation in that direction except at the times when desired. To the lower end of shaft 16 is attached an arm 151 whose end engages with a collar 152 on sleeve 33 and having a conical upper surface. When sleeve 33 moves upwardly, this collar is moved in under the end of arm 151 and causes the rotation of shaft 16 in the direction opposite to that indicated. Sleeve 33 moves upwardly immediately a record has completely passed by the reproducing mechanism, and so by this movement the reproducing mechanism is moved away from the record immediately the record has been completely reproduced; but the sleeve 33 moves downwardly again when the mandrel shaft reaches its lowermost position, and it is not desired to move the reproducing mechanism into engagement with the record until the record has been completely raised to its uppermost position; in other words, until the mandrel shaft has again reached its uppermost position. This is accomplished by means of a collar 155 on shaft 40 which engages with an arm 156 also mounted on the lower end of reproducer shaft 16 and holds the reproducer shaft against rotation in the direction indicated until shaft 40 moves upwardly when the mandrel shaft reaches the uppermost end of its stroke. Shaft 40 moves downwardly upon mandrel shaft 18 reaching its lowermost position; while sleeve 33 does not move upwardly until the mandrel shaft has reached its lowermost position and the feeding operation has completely taken place. Consequently, collar 155 will catch arm 156 and hold it in the position shown in Fig. 3 before sleeve 33 moves downwardly and allows arm 151 to move inwardly. The reproducer shaft will thus be held from rotation in the direction indicated from the time the record has been completely played till the time another record has been raised to its uppermost position ready for reproduction.

In Figs. 2 and 3 we have shown a means of supplying oil to the various mechanisms, comprised in an oil distributing pipe or tube 200 into which oil is compressed by a small pump 201 arranged with a foot-piece 202 adapted to be pressed downwardly by the lower end of shaft 18 or by collar 81 when the shaft reaches its lowermost position. Each time the shaft passes to its lowermost position a certain amount of oil is pumped up from tube 200 and is distributed to nut 53 and to the bearing of disk 55 around shaft 40. From each of these points the oil passes downwardly along the shafts and oils all of the bearings thereon thoroughly. The oil is caught in a pan 205 in the lower part of the case below the mechanism, being pumped around through the machinery and renewed when dirty. We have also shown a switch 204 attached to rod 94 in such manner that the switch will be in closed contact when the rod is in its lowermost position and will be raised out of contact when the rod is raised. In other words, the switch will be open when the mandrel shaft is in its lowermost position. This switch may be connected in multiple

with a hand operated switch to control the motor as in the last one of our applications above referred to.

Having described our invention, we claim:

1. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the record carrier about its axis, a nut engaging the screw thread, means to rotate the carrier, means to rotate the nut, and mechanism controlled by the position of the carrier to control the carrier rotating means and the nut rotating means.

2. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the record carrier, a rotating member engaging the screw thread, means to rotate the carrier, means to rotate said member, and mechanism controlled by the position of the carrier to control the said member rotating means.

3. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the record carrier, a rotating member engaging the screw thread, means to rotate the carrier, means to rotate said member, and mechanism controlled by the position of the carrier to control the carrier rotating means.

4. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the carrier with its axis arranged longitudinally, a rotatable nut engaging the screw thread, means to rotate the carrier, means to rotate the nut at a speed differing from that of carrier rotation, and mechanisms controlled by the position of the carrier to control the carrier and nut rotating means.

5. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the carrier about a longitudinal axis, a rotatable nut engaging the screw thread, means to rotate the carrier, means to rotate the nut at a speed differing from that of carrier rotation, whereby the carrier is given a longitudinal movement, means controlled by the movement of the carrier to one of its extreme positions to stop the nut rotating means and to start the carrier rotating means, means controlled by the movement of the carrier to its other extreme position to start the nut rotating means, and means controlled by the movement of the carrier to an intermediate position to stop the carrier rotating means.

6. In a device of the character described, a shaft adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the shaft, a nut engaging the screw thread, means to rotate the shaft, means to rotate the nut at a speed differing from that of the shaft, and mechanism controlled by the position of the shaft to control the nut and shaft rotating means.

7. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, means to connect the sleeve rotatably to the shaft, connective means between the sleeve and the nut whereby the nut is rotated at a speed differing from the speed of sleeve rotation, whereby the shaft is given a longitudinal movement, and mechanism controlled by the position of the shaft to control the connective means between the sleeve and the nut.

8. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, means to connect the sleeve rotatably to the shaft, connective means between the sleeve and the nut whereby the nut is rotated at a speed differing from the speed of sleeve rotation, whereby the shaft is given a longitudinal movement, and mechanism controlled by the position of the shaft to control the connective means between the sleeve and the shaft.

9. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, means to connect the sleeve rotatably to the shaft, connective means between the sleeve and the nut whereby the nut is rotated at a speed differing from the speed of sleeve rotation, whereby the shaft is given a longitudinal movement, and mechanisms controlled by the position of the shaft to control the connective means between the sleeve and the shaft and the nut.

10. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, another sleeve keyed to the shaft to slide thereon, inter-engaging means on the sleeves to rotatively connect them, gear connection between the first mentioned sleeve and the nut and adapted to be disconnected by shifting, and mechanisms controlled by the position of the shaft to slide the second mentioned sleeve out of engagement with the first mentioned sleeve, and to shift the gear connection between the first mentioned sleeve and the nut.

11. In a device of the character described, a shaft rotatable and longitudinally translatable and having a screw thread and a

longitudinal key-way, a rotatable nut engaging the screw thread, gear teeth on the periphery of the nut, a sleeve loosely mounted on the shaft and having gear teeth on its periphery, another sleeve on the shaft and engaging the key-way therein to be movable longitudinally of the shaft, said sleeves having co-engaging means causing the second mentioned sleeve to rotate from the first, a counter shaft approximately parallel to the first mentioned shaft, gears on the counter shaft engaging the gear teeth on the nut and sleeve, the gears being so proportioned that the nut and sleeve rotate at unequal speeds, means for shifting one of the counter shaft gears out of engagement with its meshing gear, said means being controlled in action by the position of the shaft, and mechanism controlled by the position of the shaft to move the second mentioned sleeve relatively to the first mentioned sleeve.

12. A device of the class described, comprising a record carrying mandrel, a shaft carrying the mandrel, said shaft being rotatable and longitudinally translatable and having a screw thread and a longitudinal key-way, a rotatable nut engaging the screw thread, gear teeth on the periphery of the nut, a sleeve loosely mounted on the shaft and having gear teeth on its periphery, another sleeve on the shaft and engaging the key-way therein to be movable longitudinally of the shaft, said sleeves having co-engaging means causing the second mentioned sleeve to rotate from the first, a counter shaft approximately parallel to the first mentioned shaft, gears on the counter shaft engaging the gear teeth on the nut and sleeve, the gears being so proportioned that the nut and sleeve rotate at unequal speeds, means for shifting one of the counter shaft gears out of engagement with its meshing gear, said means being controlled in action by the position of the shaft, mechanism controlled by the position of the shaft to move the second mentioned sleeve relatively to first mentioned sleeve, a reproducer mechanism adapted to engage a record carried by the mandrel and means whereby movement of the reproducer relative to the mandrel and record is caused by the movement of the said shifting counter shaft gear and by the longitudinal movement of the second mentioned sleeve.

13. A device of the class described, comprising a vertically journaled shaft, a circular record supporting table mounted on the upper end of the shaft, said table having a plurality of record holding pockets near its periphery, a vertical mandrel shaft mounted in bearings to revolve and slide vertically, a record engaging mandrel on the upper end of the shaft, the mandrel adapted to pass through the pockets in the record supporting table and engage with the records therein, means to revolve the mandrel shaft, a screw thread mechanism whereby the revolution of the mandrel shaft serves to raise itself, means cooperating with said last named mechanism for feeding the mandrel shaft and mandrel downwardly from their uppermost position, means for intermittently rotating the record carrying table, said means including an actuating mechanism and a controlling mechanism adapted to be operated by the mandrel shaft when at its lowermost point of travel.

14. A device of the character described, comprising a record support, a record carrier adapted to move along and rotate about a longitudinal axis, means to rotate the carrier, means to cause a longitudinal movement thereof to remove a record from the support, another means cooperating with said last named means to cause another longitudinal movement of the carrier, and mechanisms controlled by the position of the carrier to control the operation of the means causing the longitudinal movement of the carrier.

15. A device of the character described, comprising a record support, a record carrier adapted to move along and to rotate about a longitudinal axis, means to rotate the carrier, a mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation, another mechanism cooperating with said last named mechanism for causing the longitudinal movement of the carrier by virtue of its own rotation but in a ratio differing from that caused by the first mentioned mechanism, and means controlled by the position of the carrier to control the longitudinal movement mechanisms.

16. A device of the character described, comprising a record support, a record carrier adapted to move along and to rotate about a longitudinal axis, means to rotate the carrier, mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation, another mechanism cooperating with the said last named mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation but in ratio different and in a direction opposite that caused by the first mentioned mechanism, and means controlled by the position of the carrier to control the longitudinal movement mechanisms.

17. In a device of the character described, a record carrier adapted for longitudinal and rotary movement, means for rotating the carrier, means for causing a partial longitudinal movement of the carrier, means cooperating with said last named mechanisms for causing another partial movement of the carrier, and mechanisms controlled by the longitudinal position of the carrier to control both the said means for causing its longitudinal movement.

18. A device of the character described, comprising a record support, a record carrier adapted for movement along and rotation about a vertical axis, means for rotating the carrier, means for causing the record carrier to move upwardly to engage a record and move it from the record support, means coöperating with said last named mechanism for causing the carrier to move downwardly by virtue of its own rotation, and mechanisms controlled by the position of the carrier to control the means causing the carrier movements.

19. In a device of the character described, a record carrier adapted for longitudinal and rotary movement, means for moving the carrier longitudinally through a portion of its movement, means coöperating with said last named means for rotating the carrier and simultaneously moving it through another portion of its movement, mechanisms controlled by the longitudinal position of the carrier to control both the said means, and manually operable means for the control of said carrier moving and rotating means.

In witness that we claim the foregoing we have hereunto subscribed our names this 8th day of August 1911.

HARRY T. SCOTT.
LEO J. PATTERSON.

Witnesses:
JAMES T. BARKELEW,
JAS. H. BALLAGH.