

No. 671,305.

Patented Apr. 2, 1901.

J. D. BLAGDEN.
MULTIDISK PHONOGRAPH.

(Application filed June 11, 1900.)

(No Model.)

3 Sheets—Sheet 1.

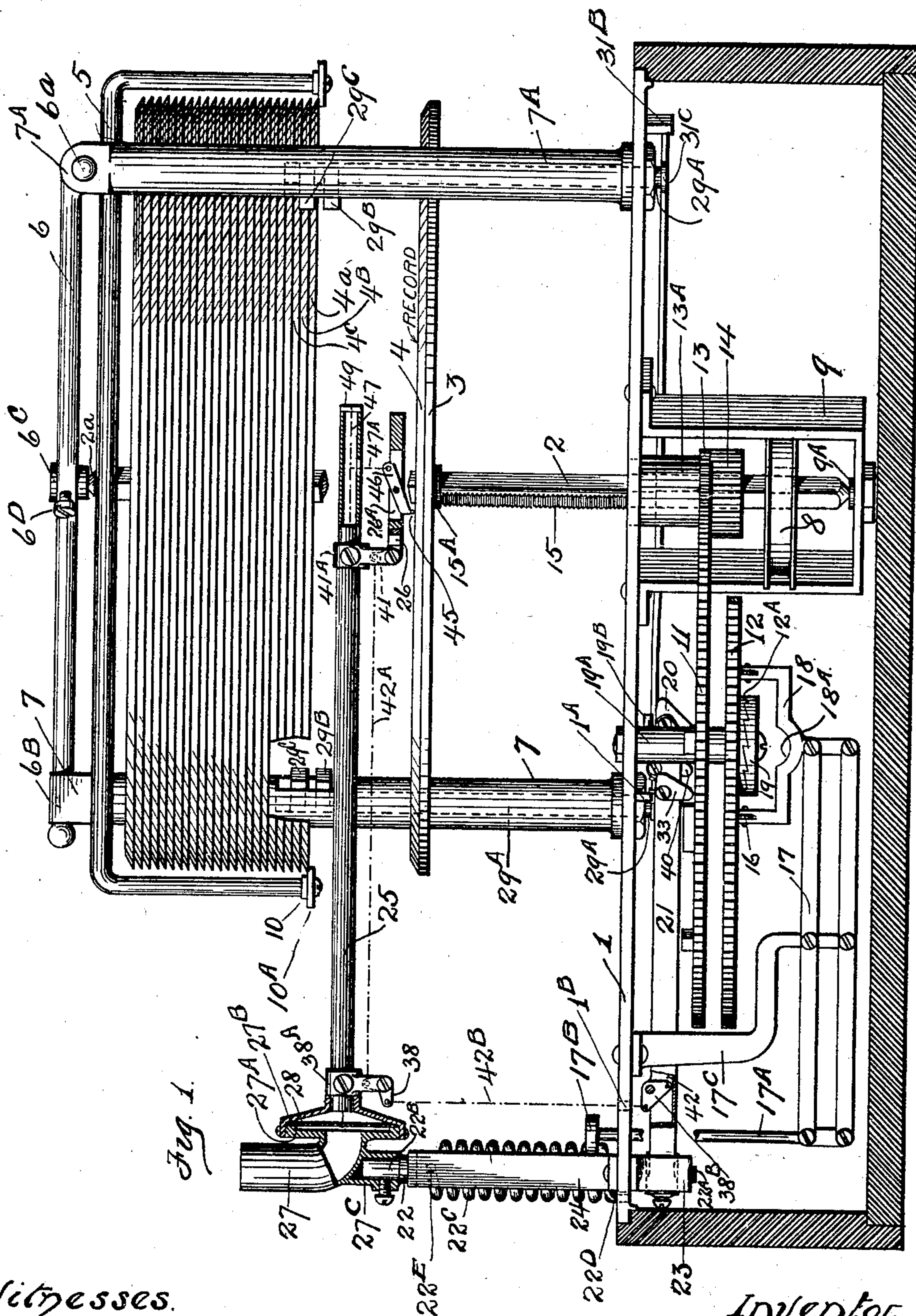


Fig. 1.

Witnesses.

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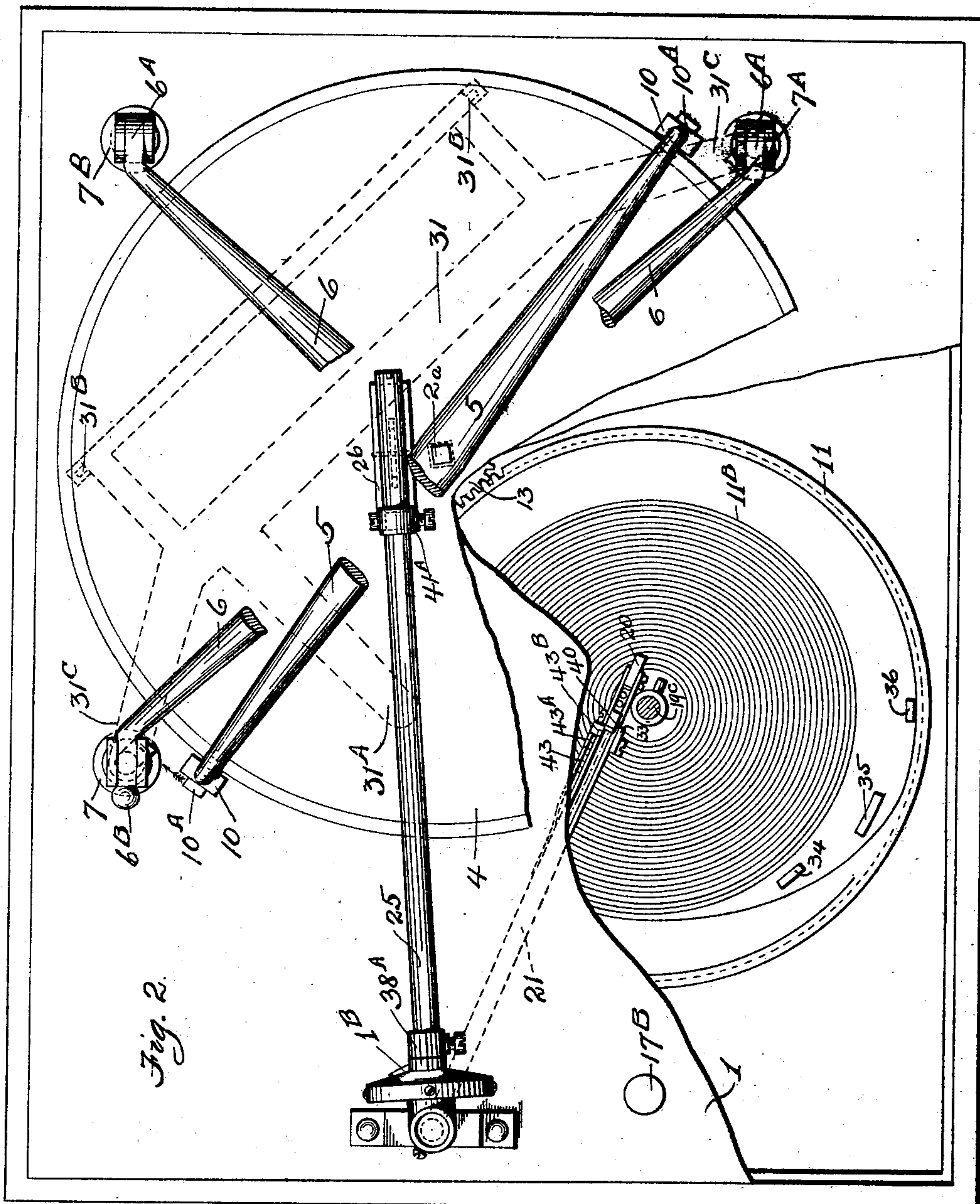
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3 Sheets—Sheet 2.



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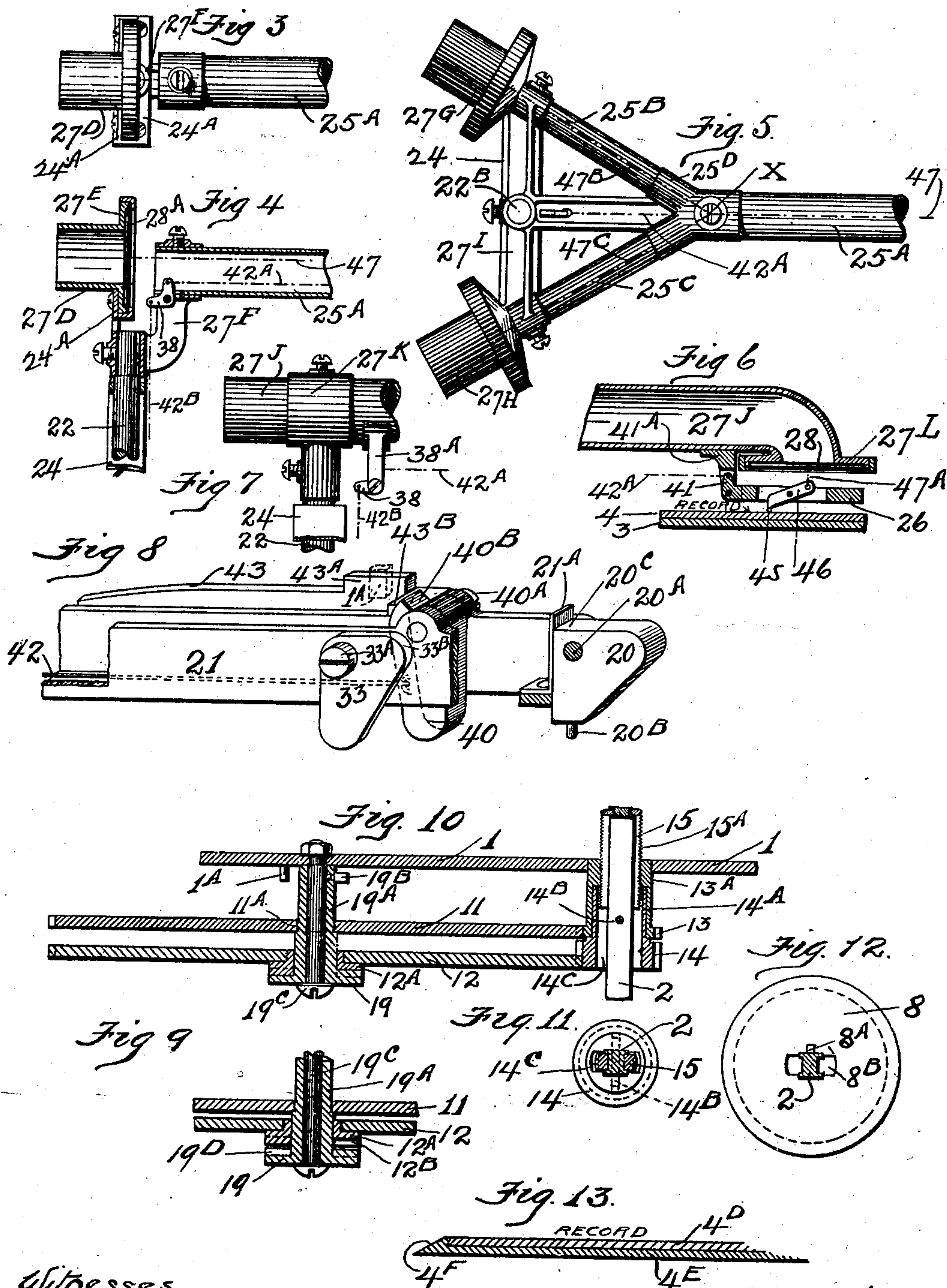
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UNITED STATES PATENT OFFICE.

JOHN D. BLAGDEN, OF MEMPHIS, TENNESSEE.

MULTIDISK PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 671,305, dated April 2, 1901.

Application filed June 11, 1900. Serial No. 19,890. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. BLAGDEN, a citizen of the United States, residing at Memphis, Shelby county, State of Tennessee, have invented certain new and useful Improvements in Multidisk Phonographs, of which the following is a specification.

My invention relates to apparatus for recording and reproducing speech, known as "phonographs," and has special reference to that class of phonographs in which the sound-record is made on flat disks.

It has for its object, primarily, to provide means whereby a subject of considerable length may be recorded and reproduced, or a series of short records may be made and reproduced in the same or in any predetermined succession continuously and automatically. It has also for its object the improvement of the details of phonographs. I accomplish the first of these objects by storing a plurality of record-disks in reserve and by automatically placing each of these disks in succession when the preceding records have been completed, by lowering the disk-table during the reproduction, so that the top of each successive record shall be at the same height at the beginning of each record, and by moving the reproducing-point over the records and returning same automatically after completion of each. I improve the details by a novel method of raising the reproducer-point and by the automatic means of accomplishing this, by the connection of the reproducer-point with the diaphragm, by the manner of supporting the reproducer-arm, and by the means of following an irregular record, as will be hereinafter more fully described in this specification.

In the accompanying drawings, which illustrate my phonograph, Figure 1 is a side elevation showing the multiple record-disks stored in the storage-bracket at the beginning of the record, with one disk in place and the reproducer in position to begin. Fig. 2 shows a plan with the stored records removed, the top frame broken away in order to show the reproducer-arm, and with the record-disk and the bed-plate partially broken away to show the directing or guiding spiral which moves the reproducer across the record. Fig. 3 shows a plan, and Fig. 4 a sectional elevation,

of a modification of some of the details. Fig. 5 is a plan of a modification in which two diaphragms are used. Fig. 6 is a section, and Fig. 7 an elevation, of the two ends of the reproducer-carrying arm, showing a modification in which the diaphragm is carried on the end of a horizontally-swinging arm directly over the reproducing-point. Fig. 8 is a mechanical perspective of an end of the guiding-arm, showing various cams or knees thereon. Fig. 9 is a sectional detail showing clutches disengaged. Fig. 10 is a sectional detail of the differential gear which regulates the height of the disk-table. Fig. 11 is a plan view of the driving-pinion, showing section of driving-shaft and segmental screw. Fig. 12 is a plan of the driving-pulley. Fig. 13 is a section of a record-disk.

Referring now to the drawings, in which like numerals represent like parts in all the views, 1 is the base-plate, which carries the three frame-posts 7, 7^A, and 7^B, to the upper ends of which a top frame 6 is hinged at the points 6^A in the posts 7^A and 7^B, the end 6^B of the top frame 6 resting in the top of the post 7. This top frame 6 carries a bearing 6^C, held by means of a set-screw 6^D or like convenient means, which is the upper bearing for the driving-shaft 2. The lower bearing 9^A for the shaft 2 is carried by a bracket 9, bolted or riveted to the under side of the base-plate 1. The driving-shaft 2 is rotated by a driving-pulley 8, which is fastened to said shaft by means of a key 8^A, (shown in Fig. 12,) or, if it is so desired, by means of a pin (not shown) inserted through the pulley and the shaft. The pulley 8 (see Fig. 12) touches the driving-shaft 2 on two of its sides only. On the other two sides spaces 8^B are left, through which spaces the segmental screw 15 is free to pass.

14 (see Figs. 10 and 11) is a driving-pinion which is fastened to the shaft 2 by a pin 14^B, inserted through the shaft and the pinion. The upper part of this pinion is turned down to give a cylindrical portion 14^A, on which is journaled a second pinion 13, which has integral with it at its upper end a nut 13^A, with which mesh the threads on the segmental screw 15, which is slidably mounted on the driving-shaft 2. This segmental screw 15, as shown in Fig. 11, is apparently composed of

two pieces oppositely disposed in grooves in the driving-shaft 2; but reference to Fig. 1 shows that the upper end of these pieces is connected by an annular portion 15^A, which screws into the disk-table 3, which table supports the record-disk 4 while it is in use. Geared to the driving-pinion 14 is a large gear 12, and concentrically mounted therewith is another gear 11, which carries the directing-spiral 11^B. I will in this specification designate the gear 11 as the "directing-gear" 11. The directing-gear 11 meshes with the pinion 13, which is journaled on the driving-pinion 14. The directing-gear 11 is rigidly fastened to a hollow spindle 19^A, which is free to turn upon a spindle 19^C, rigidly fastened to the bed-plate 1. The lower end of the spindle 19^A carries a clutch 19, (more fully shown in Fig. 1,) which clutch engages with a clutch 12^A, fastened to the gear 12, loosely mounted on the hollow spindle 19^A.

The directing-gear 11 is made with one tooth more than the gear 12, so that when the gear 12 is driven by the driving-pinion 14 the gear 11, rotating with the gear 12, drives the pinion 13 at nearly the same rate of speed as that of the driving-pinion 14, moving them relatively one tooth during each revolution. The teeth on gears 11 and 12 and the thread on the segmental screw 15 are so related that in making a complete reproduction of any record, as that on the disk 4, the pinions 13 and 14 move relatively to each other a sufficient number of times to lower the disk-table 3 and the record-disk 4 exactly the thickness of one disk, thus bringing the upper portion of the disk 4 in the same position at the end of the record that the upper portion of the disk-table 3 occupied at the beginning of the record, the object of this being to make use of the record-disk 4 as a table upon which to bring another record-disk 4^A down to have each disk in turn to form the table for the succeeding disk, making it possible to reproduce all the stored records in succession without removing the former record.

Fig. 9 shows the gear 12 and the attached clutch 12^A, with the teeth 12^B on the said clutch disengaged from the teeth 19^D on the clutch 19. In this case the gear 12 is free to rotate upon the spindle 19^A, which spindle, as before mentioned, carries the gear 11, and is therefore free to rotate relatively to the said gear 11. To raise the gear 12 and the clutch 12^A attached, I show in Fig. 1 a fork 18, carrying rollers 16 at the upper end of its arms, which rollers bear against the under side of the gear 12 when the fork is put into use. This fork 18 is carried by parallel bars 17, which are supported on a bracket 17^C, fastened to the base-plate 1. At the left-hand end of these bars, as shown in Fig. 1, a rod 17^A is fastened, which rod terminates in a button 17^B. By pressing down upon this button the fork 18 is raised and the rollers 16 press against the under side of the gear 12 and raise same until the clutch 12^A disengages from the clutch

19. Any further motion brings the fork 18 against the under side of the clutch 19 as a brake. The fork is cut away at 18^A to allow the fork 18 to bear against the under side of the clutch 19 without touching the stationary spindle 19^C. When this brake comes against the clutch 19 and stops it, it holds the hollow spindle 19^A and the gear 11 attached thereto stationary. If now the pulley 8, attached to the main driving-shaft 2, be rotated, the gear 11 holds the pinion 13 and its attached nut 13^A stationary and causes the segmental screw 15 to raise or lower rapidly, depending on the direction in which the driving-pulley is rotated. This gives a quick means of raising the segmental screw 15 and the attached disk-table 3, carrying the records 4 4^A, &c., when the entire set of records or any desired portion thereof have been used and it is desired to begin anew. It also furnishes a rapid means of bringing any desired record into place should it be desired at any time to skip one or more of them.

Upon the face of the directing-gear 11 I cut a spiral groove 11^B, which I call the "directing-spiral." A guiding-pin 20^B, projecting from the lower portion of the guiding-knee 20, which knee is carried by a guiding-arm 21, works in this groove and by means of connecting-pieces directs the motion of the reproducer-point over the record 4 4^A, &c. The arm 21 is fastened by a set-screw or other convenient means to the lower end 22^A of an oscillating spindle, which spindle has the reproducer-arm 25 fastened to it at its upper end 22^B.

23 and 24 are brackets, fastened, respectively, underneath and above the base-plate 1, which carry the oscillating spindle 22. These brackets are preferably fastened, as shown, by the same rivets or bolts to the base-plate. The upper end 22^B of the oscillating spindle 22 is slightly reduced in size, and on this reduced portion is fastened the bracket 27^C, which carries the reproducer-arm 25. This bracket 27^C, as shown in Fig. 1, is an extension of a tubular sound-conveyer 27, which I have shown terminating vertically.

27^A is a circular plate which carries the diaphragm 28. 27^B is a conical cover which is fastened to this circular plate 27^A and which carries the reproducer-arm 25, to which it is rigidly attached. The reproducer-arm may be made of any convenient form, but I have shown it in the drawings attached as a tube.

The reproducer-arm 25 is rigidly fastened to the oscillating spindle 22, so that while free to move horizontally, or, rather, to be moved horizontally, it has no vertical motion whatsoever except such as is incidental to the play of the spindle 22 in its bearings. It is intended then that none of the weight of the reproducer-arm shall rest on the record. The free or swinging end of the reproducer-arm 25 carries a bracket 41^A, in which is pivoted a tension-lever 26, which carries in turn the reproducer-point 45. The reproducer-lever 46

is pivoted near its center in the tension-lever 26. One end carries the reproducer-point 45 and the other is attached by a short cord 47^A to the reproducer-cord 47, which leads to the diaphragm 28. The cord 47^A passes through an opening in the under side of the reproducer-arm 25, which, as stated, is tubular and is attached at right angles to the reproducer-cord 47. One end of the cord 47 is attached to a piece 49 at the end of the reproducer-arm 25 and leads thence through the center of the said arm to the diaphragm 28 at the opposite end thereof. When the phonograph is reproducing, the reproducer-point 45 rests by its own weight and the weight of the tension-lever 26 upon the record 4. When the record has been completed and it is necessary to carry the arm 25 back to its initial position to begin a record, it is necessary to raise the reproducer-point 45 from the record. Ordinarily this is done by raising the entire arm 25 and the diaphragm attached clear of the record. I accomplish this, however, by means of an arm 41 at right angles to the tension-lever 26, which arm is attached by a cord 42^A to a bell-crank 38, carried at the opposite end of the arm 25, and is thence connected by the second cord 42^B to another bell-crank 38^B, which is carried on the guiding-arm 21. This last bell-crank 38^B is connected by a cord 42, which passes along the guiding-arm 21 and is attached near the free end thereof to the knee 40, which knee is automatically tripped at the end of the record by a cam 34 on the upper face of the directing-gear 11 when the record shall have been completed.

1^B is a slot in the base-plate 1, through which the cord 42^B passes.

When the knee 40 strikes the cam 34 on the upper face of the gear 11, it pulls the cord 42 forward and raises the tension-weight 26, which carries the reproducer-lever 46, thus raising the reproducer-point from the record, as above stated. As the knee 40 moves forward the spring 45 catches on the top of lug 40^B on the knee 40 and holds the same until the arm 21 shall have swung back to its original position at the beginning of the record and the lug 43^A on the spring 43 shall have come in contact with the pin 1^A, which projects from the under side of the base-plate 1. This pin 1^A stops the spring 43, while the swinging arm 21 continues to move, thus disengaging the lug 43^B from the lug 40^B and allowing the reproducer-point to again drop on the record. The gear 11, turning still farther, brings the cam 35 in contact with the knee 33, also carried by the swinging arm 21, revolving same about the pin 33^A and bringing the point 33^B, Fig. 8, into its highest position just when the knee 33 is under the end of the arm 31^A (shown in Fig. 2) of the hinged piece 31, thus raising the said arm 31^A and piece 31, to which it is attached, upward. The piece 31 is pivoted at 31^B and has the arm 31^A and the arms 31^C extending outward from it. The arms 31^C extend beneath the

post 7 and 7^A, which are hollow and support rods 29^A, which extend upward in these hollow columns. The rods 29^A terminate in lugs 29^B and 29^C, (designated from their purpose as "tripping-lugs,") which lugs project through slots cut through the posts 7 and 7^A.

5 is a record-storage bracket resting at 2^A on top of the main shaft 2 and revolving therewith. It has at its lower end lugs 10 and 10^A to support the stored records 4^A 4^B, &c. These lugs, as shown in Fig. 2, are rectangular in shape, disposed at right angles to each other, with one lug 10 above the companion lug 10^A. The lowest record-disk 4^A rests on the lug 10^A and with the remainder of the stored plates is carried around as the shaft 2 and bracket 5 revolve. The tripping-lugs 29^B and 29^C above mentioned are so spaced and normally so disposed that the lug 10^A passes between them as the bracket 5 revolves, and they are further sufficiently distant from the bracket 5 to allow the lug 10, having its line of greatest length at right angles to the direction of motion, to clear them. When, however, the knee 33 comes under the arm 31^A and raises it, and with it the attached arms 31^C, these arms 31^C raise the rods 29^A and the lugs 29^B and 29^C attached, bringing the lug 29^B into the path of the lug 10^A, so that it will engage the said lug and cause it to turn and at the same time bringing the space between the lugs 29^B and 29^C into the path of the lug 10, thus allowing same to turn freely, and thus dropping the lowest record-disk 4^A and allowing the next record 4^B to drop on the lug 10, which is turned under it as the piece 10^A is turned from under the lower record. As soon as the cam 35 passes from beneath the knee 33 it allows the arm 31^A, and with it the arms 31^C, carrying the posts 29^A, to drop and brings the tripping-lug 29^C into the path of the lug 10. This lug, striking the tripping-lug 29^C, rotates a one-quarter turn as before and drops the stored records on the lug 10^A, where they remain until the record 4^A, which has been dropped on top of the record 4, has been reproduced. Just prior to dropping a new record, however, the arm 21, guided by the directing-spiral 11^B on the gear 11, which arm has been moving outwardly uniformly, brings the knee 40 into position and it is struck by the cam 34, which pushes it forward and raises the reproducer-point 45 from the record. At this point the arm begins to move outward much more rapidly and continues to so move until the reproducer-arm 25, carrying the reproducer-point 45, is clear of the record-disks. The spiral 11^B continues then in a circular arc for a sufficient part of one revolution to allow the placing of a new record, as just described. The stored plate 4^A is therefore free to drop to the top of the record 4, which is supposedly already in place on the disk-table 3. As soon as the record 4^A drops the cam 36 on the directing-gear 11 strikes the knee 20 and raises the point 20^B (shown in Fig. 8) out of the spiral groove 11^B.

Referring again to Fig. 8, it will be seen that the knee 20 rests against a spring 21^A, which is riveted or otherwise rigidly fastened to the arm 21, the knee being held in place by the pressure of this spring against the corner 20^C of the knee. Now when the cam 36 strikes the knee 20 it rotates about the pin 20^A and the corner 20^C presses against the spring 21^A until the knee 20 shall have been turned at right angles to the position shown in Fig. 8, at which time the spring 21^A presses against the upper face of the knee 20 and holds same until means shall have been applied to replace it. This means is furnished when the arm 21 shall have turned to the center to begin a new record by bringing the knee 20 against a pin 19^B. (Shown in Fig. 1.) This pin 19^B is fastened into the hollow rotating spindle 19^A, which carries the directing-gear 11. The pin 19^B strikes the upper side of the knee 20 and forces it down into its original position, bringing the point 20^B thereon into the spiral groove 11^B at its point of beginning near the center of the gear 11. The guiding-arm 21, carrying with it the reproducer-arm 25, is swung back to this central position by means of a spring 22^C, which is fastened at 22^D into the base-plate 1 and at 22^E into the spindle 22. As soon, therefore, as the pin 20^B on the knee 20 has been raised out of the spiral groove at the outside of the gear 11 this spring 22^C comes into action and carries the arm 21 back to the center, with the result before mentioned—namely, the hollow spindle 19^A, turning, carries the pin 19^B against the upper part of the knee 20 and forces the point 20^B down into the spiral groove 11^B on the directing-gear 11. Immediately thereafter the pin 1^A strikes the lug 43^A on the spring 43 and moves the lug 43^B on the said spring out of engagement with the lug 40^B on the knee 40, thus allowing the reproducer-point 45 to rest on the record 4^A, which has been placed as above stated, starting thus the reproduction of the record.

I have confined this description so far to a diaphragm 28, which is carried in an extension 27^A 27^B of the speaking-tube 27, which is rigidly attached to the reproducer-arm 25, the vibrations being carried from the reproducer-point 45 to the diaphragm 28 by the reproducer-lever 46, connected by a cord 47^A to a cord 47, extending along the center of the hollow reproducer-arm 25 and attached to the diaphragm 28 at its center. When, therefore, the arm 25 swings around, the diaphragm swings with it, keeping the cord 47 always at right angles to the said diaphragm, to which it is attached.

In Figs. 3 and 4 I have shown a modification in which the diaphragm 28^A is carried in a holder 27^E, supported by a bracket 24^A, bolted to the bracket 24, the center of the diaphragm being exactly over the center of the oscillating spindle 22, which spindle extends up through this bracket 24. The reproducer-arm 25^A is carried, as before, by a bracket

27^F, fastened rigidly to this spindle. The reproducer-arm 25^A, oscillating with the oscillating spindle 22, keeps the cord 47 always taut, and although the diaphragm 28^A is stationary the sound is reproduced in exactly the same manner as where the diaphragm is carried on the moving shaft. In this case, too, I have shown the hollow reproducer-arm 25^A as of slightly-larger size than that shown in Figs. 1 and 2 in order to carry the cord 47 near the upper part of the arm instead of through the center of same, and thereby to leave space at the bottom to bring the cord 42^A also, which cord raises and lowers the reproducer-point 45, inside of this tube, obtaining in that way protection for both.

In Fig. 5 I have shown a modification in which I carry two diaphragms in holders 27^G and 27^F, which diaphragms are connected by means of cords 47^B and 47^C, respectively, with the main cord 47, leading, as before, to the end of the reproducer-arm 25^A. These cords 47^B and 47^C are joined at the point X (shown in Fig 5) to the cord 47 and are protected by a Y-shaped extension of the tube 25^A, through the branches 25^B and 25^C of which these cords pass. The tripping-cord 42^A extends through an opening (not shown) in the lower part of the Y 25^D and is further protected by the frame 27^I, which carries the reproducer-arm 25^A and its Y branches 25^B and 25^C, with the diaphragms thereon.

In Fig. 6 I show a still further modification of the reproducer-arm, in which the diaphragm 28 is carried on the end of the reproducer-arm 27^J and is connected immediately with the reproducer-lever 46 by means of the short cord 47^A, the longer cord 47 used in the other cases being dispensed with. In this case I have shown the cord 42^A, which raises and lowers the reproducer-arm 46, unprotected as in the first case. The reproducer-arm 27^J in this case is the sound-conveyer and speaking-tube also.

Fig. 13 shows a section of a record, showing the wax or wax-like surface 4^D, carried on a plate 4^E of sheet metal. This plate is thickened at the edge to protect the edge of the record and to allow the part 4^F to be beveled in order to permit the action of the pieces 10 and 10^A, before described.

I desire to call special attention to the fact that the arm 25, which carries the reproducer tension-lever 26 and the reproducer-lever 46 and point 45, is free to move in a horizontal plane, but that it has no vertical motion. The shaft 22, however, is made and so placed in the brackets 23 and 24 that it may be raised bodily a small distance. In raising this shaft the reproducer-arm 25 and the guiding-arm 21 are both raised through their entire lengths. It is thus possible to raise the reproducer-point 45 clear of the record and the guiding-point 20^B clear of the directing-spiral 11^B and to swing them to one side to clear the record and allow same to be removed or to allow new records to be put in place. It also pro-

vides means of changing the reproducing-point from one part of the record to another and to reproduce any part of a record. The advantage of this construction is that I can make a stiff and durable arm and not damage the record by excessive weight upon it. I am also enabled thereby to use a much larger record, as I am not limited by the weight of this arm. All the vertical motion necessary to raise the reproducer-point 45 and the reproducer-lever 46 clear of the record is obtained by raising the tension-lever 26 by means of the cord 42^A working through the bell-cranks 38^B, 38, and 41. I am thus enabled to use an arm of any length or weight that I desire without fear that it will press too hard upon the record and cut or destroy same. The entire pressure of the record in the case of this arm is governed by the weight of the reproducer tension-weight 26. This tension-weight is pivoted in a bracket 41^A, carried near the end of the reproducer-arm 25, 25^A, or 27^J, as the case may be. The reproducer-lever 46 is pivoted in the tension-weight 26 and is connected by the cord 47^A directly to the diaphragm 28 or by means of the cord 47 with the diaphragm 28, as the case may be. Now when the reproducer tension-weight 26 is lowered by the slacking of the cord 42^A the reproducer-point 45 is lowered till it rests on the record. The reproducer tension-weight 26 exerts a constant pressure through the lever 46 to press the point 45 on the record and at the same time it produces a constant tension of the cord 47^A. It will be seen that inequalities in the record will be followed by the reproducer-point 45. In this case the reproducer-point 45 is expected to follow the whole thickness of the records, being the amount that the disk-table lowers during each record.

Having described in detail the different parts of my phonograph, the action of the same is as follows: A record 4 having been placed on the disk-table 3, the phonograph is started by means of mechanism, (not shown or described,) which may be a motor placed in one corner of the box and driven by a belt through the pulley 8 or by any other desired means, for which means I make no claim. The operating mechanism, however, having been set in motion, the record is rotated, and at the same time the pinion 14, keyed to the shaft 2, rotates the gear 12 and through clutches 12^A and 19 the directing-gear 11. As this gear rotates the point 20^B on the knee 20 moves slowly outward in the spiral groove 11^B, carrying the arm 25 outward from the center at the same time, the plate carrying the record 4 being rotated more rapidly than is the gear 11 in the ratio of the diameters of the gear 12 and the pinion 14. The spiral, therefore, on the record 4 is much closer than the groove cut in the upper portion of the directing-gear 11, by which means a very fine and close record may be made on the disk 4 with a comparatively coarse spiral on the directing-gear. During this time the gears 11 and

12 slowly rotate the nut 13^A with reference to the segmental screw 15. The thread on this segmental screw and the number of teeth on the gears 11 and 12 are so related that when the record shall have been completed the nut 13^A will have lowered the said segmental screw the thickness of one record. The reproducer-arm 25 having completed the record on the disk 4, the cam 34 is in such position that it strikes the knee 40 and raises the tension-weight 26, and with it the reproducer-point 45, clear of the record. The directing-groove passes rapidly toward the edge of the gear 11 and swings the reproducer-arm 25 clear of the record and record-table 3. As the arm 25 swings clear the cam 35 strikes the knee 33 and raises the arm 31^A and attached arms 31^C, which raise the rods 29^A and bring the lug 29^B thereon into engagement with the lug 10^A, rotating it a one-fourth turn, and drops the record 4^A downward upon the completed record 4, the lug 10 by the same rotation having engaged the second record 4^B and prevented it from falling. As soon as the cam 35 passes the knee 33 the knee 33 drops back to its original position and allows the rod 29^A, carrying the lugs 29^B and 29^C, to drop to its original position. This brings the lug 29^C into engagement with the lug 10, which it rotates a one-fourth turn, allowing the stored records to drop to the lug 10^A, as before. Immediately after this is done the cam 36 in the gear 11 strikes the knee 20 and raises the point 20^B clear of the spiral groove in the upper face of the gear 11, the knee being held in its raised position by the spring 21^A. This releases the guiding-arm 21 and allows the coil-spring 22^C to throw the same and the reproducer-arm back to the center. The lug 40^A on the spring 43 engages the pin 1^A, fastened in the under side of the base-plate 1. This disengages the spring 43 from the knee 40 and allows same to drop to its original position, and with it the reproducer-point 45, to come down upon the record-disk 4^A. The hollow spindle 19^A, rotating, brings the pin 19^B against the upper part of the knee 20 and turns this knee down, bringing the point 20^B into the spiral groove 11^B in the directing-gear 11 and the reproduction begins anew, as with the first record. This is repeated until all the records or any desired portion thereof shall have been used. It will be seen that by storing a number of records a subject of considerable length may be reproduced. The delay incident to changing from one record to the next being short, the interruption will amount to almost nothing. In the case of a speech extending over considerable space of time this will be extremely valuable. While the reproducer is traversing the records the record-table is slowly lowered by means of the differential gears 11 and 12, being lowered each time exactly the thickness of one record. If all the records are used, this will bring the record-table 3 to the bed-plate. When all the records in the

bracket 5 have been transferred to the record-table 3, or if at any time during the reproduction it is desired to begin again, the top frame is thrown back and the records are lifted off the record-table 3 and out of the phonograph. They are then replaced in the bracket 5 and the same is placed again over the shaft 2. The button 17^B is now pressed, and the fork 18 raises the clutch 12^A, attached to the gear 12, out of engagement with the clutch 19, attached to the gear 11. Further pressure on the button 17^B causes the upper face of the fork to engage the under side of the clutch 19 on the gear 11 and prevents the rotation of the pinion 13, carrying the nut 13^A. If now the shaft 2 be rotated, the segmental screw 15 will rise rapidly through the nut 13^A until the record-carrier 3 comes to its original position, at which time the button 17^B may be released, and the arm 25 having been brought to the center reproduction begins anew. It is of course possible to throw the button 17^B in at any time and by reversing the motion of the shaft 2 to lower the disk-table 3 to any desired point, and by dropping the proper number of records 4^A, 4^B, &c., on this disk-table it is possible to begin at any point.

While in the attached claims I have introduced some of the details of construction, I wish it understood that I reserve the right to vary the minor details herein described without prejudice to my interests.

Having thus fully described my phonograph, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a phonograph, the combination with the reproducer and means of causing same to be moved over a record, of a disk-table, a plurality of records carried above said disk-table and means of dropping each of said records into place successively, at the end of each reproduction, substantially as shown and described.

2. In a phonograph having disk-records, the combination with a horizontal swinging arm, a reproducer carried thereon, means of causing said reproducer to follow a record and means of rotating said record, of a disk-table, a plurality of records supported above said table, and means of dropping said records into position successively and automatically after the completion of each record, substantially as shown and described.

3. In a phonograph, the combination with a rotating shaft, a record-carrying-disk table carried thereon, a bracket carried on said shaft supporting a plurality of records, and means of automatically dropping each of said records successively, substantially as shown and described.

4. In a disk-record phonograph, the combination with a rotating shaft, a disk-table mounted thereon, a bracket mounted on said rotating shaft adapted to carry a plurality of disks, lugs on the bottom of said bracket to support the disks, and means of automatically

rotating said lugs at the completion of each record to drop another record into place, substantially as shown and described.

5. In a phonograph, the combination with a rotatable shaft, a record-carrying table mounted thereon, a record thereon, a bracket carried by said rotating shaft adapted to hold a plurality of record-disks, lugs on the bottom end of said bracket adapted to support said records, suitable bearings for said rotating shaft and a suitable frame to carry said bearings, said frame having hollow posts, rods mounted in the hollow posts of said frame, said rods having lugs on their upper ends to engage the lugs on the lower end of the storage-bracket, the lugs on the said rods being normally out of the path of the bracket-lugs, and means of raising said rods to cause the lugs to turn thereon to come into the path of and engage with the lugs on the lower end of the bracket to cause one of the storage-records to drop into position automatically, when the record below shall have finished, substantially as shown and described.

6. In a phonograph, the combination with a suitable base-plate, a suitable frame mounted thereon, a shaft carried in bearings in said frame, said shaft carrying a disk-table, a bracket for storing a plurality of records, lugs on the lower end of said bracket, rods, in the hollow posts of said frame, resting on a hinged piece, the said hinged piece underneath the said base-plate and means of raising the hinged piece automatically, to raise the rods in the hollow posts and cause the lugs on said rods to engage the lugs on the record-storage bracket, to drop a record into place at the completion of a former record, substantially as shown and described.

7. In a phonograph, the combination with a base-plate, a suitable frame mounted thereon, gearing carried beneath the said base-plate, a shaft pivoted in bearings in said frame, said shaft having pinions thereon to engage the said gearing, a record-carrying-disk table mounted on said rotating shaft, a record-storage bracket carried on the upper end of said rotating shaft, lugs on the lower end of said bracket to support the stored records, rods set in the hollow posts of the frame, lugs on the rods projecting through holes in the sides of the posts, a swinging piece under the base-plate having arms on which the rods rest, a cam on the upper gear, a swinging arm, a knee pivoted near the end thereof and means of bringing the swinging arm to such position that the said knee thereon will be engaged by the lug on the gear, and will raise the said swinging piece and the rods supported thereon, and thereby cause the lugs on the rods, to come into the path of, and to engage the lugs of the storage-bracket and rotate same to drop a record into position at the completion of the former record, substantially as shown and described.

8. In a phonograph, the combination with a base-plate a suitable frame thereon, a driv-

ing-shaft rotating in bearings in said frame, a record-carrying-disk table slidably mounted on said shaft, a record-storage bracket carried on said shaft, and means of dropping
5 each record successively into place, automatically upon the completion of the preceding record, of differential gearing to lower the record-carrying disk through the thickness of a record, substantially as and for the purposes set forth.

9. In a phonograph, the combination with a base-plate, a suitable frame mounted thereon, a driving-shaft journaled in said frame, a record-carrying-disk table slidably mounted
15 thereon, a storage-bracket carried on the upper end of said shaft, a plurality of records carried by said bracket and means of dropping successive records into place, of a segmental screw fastened to said disk-table and
20 slidably mounted on said shaft, a nut rotatably mounted on said shaft and engaging said segmental screw, and differential gearing for rotating said nut relatively to said shaft and segmental screw, to lower the disk-table
25 through the thickness of one record-disk during the reproduction of a record, substantially as shown and described.

10. In a phonograph the combination with a rotating record-table and a record thereon,
30 of a horizontal swinging arm carrying a reproducer on the swinging end thereof, and means of causing the arm to swing away from the center of the record-table and the record thereon and to follow a spiral record, said
3 means consisting of a separate guiding-spiral of coarser pitch, a point to follow said spiral and means of connecting this point with the reproducer-point, substantially as shown and described.

40 11. In a phonograph, the combination with a record-table, a record thereon, a horizontal swinging reproducer-arm, moving thereover, said arm carrying a record-reproducer, and means of causing said reproducer to follow
45 the record consisting of a rotating gear with a spiral groove in the web thereof, a swinging guiding-arm rigidly fastened through a vertical spindle to the said reproducer-arm, a point on the end of said guiding-arm en-
50 gaging with the spiral groove in the web of the said rotating gear, and means of rotating said gear substantially as shown and described.

12. In a phonograph, the combination with
55 a rotatable record-table, a horizontally-swinging reproducer-arm carrying the reproducer-point, and means of causing said reproducer-point to follow the record, of means of raising said reproducer-point clear of the record,
60 independently of the reproducer-arm substantially as shown and described.

13. In a disk-phonograph the combination with a disk-table mounted on a rotating shaft, a bracket mounted on said rotating shaft
65 adapted to carry a plurality of disks, a plurality of disks therein, lugs on the bottom of said bracket to support the disks, and

means of automatically rotating said lugs at the completion of each record, to disengage the said lugs from the disks and to drop same
70 in place, substantially as shown and described.

14. In a disk-phonograph, the combination with a disk-table mounted on a rotating shaft, a bracket mounted on said rotating shaft adapted to carry a plurality of disks; a plu-
75 rality of disks carried thereby, said disks having beveled edges; lugs on the bottom of said bracket to support the disks, and means of automatically rotating said lugs at the completion of each record to drop a new re-
80 cord into place, substantially as shown and described.

15. In a phonograph, the combination with a base-plate, a suitable frame thereon, a driving-shaft adapted to rotate in bearings in said
85 frame, means of rotating said shaft, a record-carrying-disk table, a segmental screw attached to said disk-table and slidably mounted on said shaft, a record-storage bracket carried on said shaft, and means of dropping
90 each record into place automatically upon the completion of the preceding record; of a pinion fastened to said driving-shaft, said pinion engaging with a gear engaging with a second gear fastened thereto, said second
95 gear having one tooth more than the gear to which it is attached and meshing with a second pinion rotatably mounted on the driving-pin-
100 ion; said second pinion having a nut formed therein, which nut engages with the segmental screw to lower the record-table, substantially as and for the purposes set forth.

16. In a phonograph, the combination with a base-plate, a suitable frame mounted there-
105 on, a driving-shaft journaled in said frame, a storage-bracket carried on the upper end of said shaft, a plurality of records carried in said record, and means of dropping suc-
110 cessive records into place; of a record-carrying-disk table a segmental screw fastened to said disk-table and slidably mounted on said shaft, a nut rotatably mounted on said shaft and engaging said segmental screw, a differ-
115 ential gear for rotating said nut with reference to said shaft, a segmental screw to lower the disk-table through the thickness of one record-disk, during the reproduction of a record; and means of throwing the differ-
120 ential gearing out of action, to permit the rapid raising or lowering of the disk-table, substantially as shown and described.

17. In a phonograph, the combination with a base-plate, a suitable frame thereon, a driv-
125 ing-shaft journaled in said frame, a storage-bracket carried on the upper end of said shaft, a plurality of records carried by said bracket, and means of dropping successive records into place, a record-carrying-disk table, a segmen-
130 tal screw fastened to said disk-table and slidably mounted on said shaft and engaging said segmental screw; a gear driving said nut, a second gear fastened to said driving-gear by a clutch, and a pinion on said driving-shaft

driving said second gear, of a fork adapted to raise said second gear to throw the clutch thereon out of engagement with the driving-gear; said fork being formed also as a brake to hold the driving-gear and the nut engaged therewith, so that the disk-table may be rapidly raised or lowered, substantially as shown and described.

18. In a disk-record phonograph, the combination with a driving-shaft, a bracket supported thereon carrying a plurality of record-disks and means of dropping each of these disks successively on the completion of the preceding record; of a segmental screw slidably mounted on said driving-shaft, a disk-table attached thereto, a nut with pinion thereon engaging said segmental screw said nut-pinion being rotated with reference to the said driving-shaft and segmental screw by means of differential gearing composed of a pinion rigidly fastened to said driving-shaft, a lower gear driven by said pinion, said lower gear having a clutch on its under face to engage with a clutch attached to an upper driving-gear which has one tooth more or less than the lower gear and the said driving-gear meshing with the said nut-pinion, and openings cut through the driving-pinion to permit the passage of the segmental screw, substantially as and for the purposes set forth.

19. In a disk-record phonograph, the combination with a driving-shaft, a bracket supported thereon carrying a plurality of record-disks, and means of dropping each one of these disks successively on the completion of the preceding record; a segmental screw slidably mounted on said driving-shaft, a disk-table attached thereto and a nut having a pinion thereon engaging said segmental screw said nut-pinion being rotated with reference to the said driving-shaft, a gear driven by said pinion, said driven gear having a clutch on its under face to engage with a clutch attached on a driving-gear having one tooth more or less than the driven gear, the said driving-gear meshing with the said nut-pinion, and openings cut through the driving-pinion to permit the passage of the segmental screw; of a fork adapted to raise the driven gear and the clutch thereon out of engagement with the clutch on the driving-gear, and to press against the clutch on the said driving-gear as a brake to hold the said gear and the nut-pinion meshing therewith, so that the segmental screw may be rapidly rotated thereon to raise or lower the disk-table, substantially as and for the purposes set forth.

20. In a phonograph, the combination with a rotating record-table and the record thereon, of a horizontally-swinging arm carrying a reproducer-point on the swinging end thereof, and means of causing the arm to swing outward from the center of the record-table and the record thereon and to follow a spiral record, said means consisting of an independent spiral, a directing-point to engage

with same connecting members to connect the point and the reproducer-arm and means of releasing said arm by tripping said directing-point out of the directing-spiral and at the same time tripping the reproducer-point clear of the record, and means of returning said swinging arm to the center of the record, substantially as and for the purposes set forth.

21. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a record-reproducer, and means of causing said reproducer to follow the record, said means consisting of a rotatable gear with a spiral groove in the web thereof, means of rotating said gear, a swinging guiding-arm rigidly fastened through a vertical spindle to the reproducer-arm, a point on the end of said guiding-arm engaging with the spiral groove in the web of said rotating gear, and means of returning the said reproducer-arm to the center to begin a new record, substantially as shown and described.

22. In a phonograph, the combination of a record-table, a record thereon, means of operating said table, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a reproducer, and means of causing said reproducer to follow the record, said means consisting of a rotating gear with a spiral groove in the web thereof and means of rotating said gear, a swinging guiding-arm rigidly fastened through a vertical spindle to the said reproducer-arm, a point on the end of said guiding-arm engaging with the spiral groove in the web of the rotating gear, a cam on the said gear to disengage the said point from the spiral groove and a coil-spring to bring the reproducer-arm back to the center when the point is disengaged substantially as shown and described.

23. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging arm moving thereover, said arm carrying a record-reproducer, and means of causing said reproducer to follow the record, consisting of a rotating gear with a spiral groove in the web thereof, and means of rotating said gear, a swinging guiding-arm rigidly fastened through a vertical spindle to said reproducer-arm, and a point on the end of said guiding-arm engaging with the spiral groove in the web of the rotating gear, of means of raising the reproducer-point clear of the record, means of disengaging the said point from the spiral groove, and means of returning the reproducer-arm to the point of beginning said means consisting of a coil-spring attached to the vertical spindle and the base-plate, substantially as shown and described.

24. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a record-reproducer, a vertical spindle, a swinging guiding-arm

rigidly fastened through the said vertical spindle to said reproducer-arm, a rotatable gear with a spiral groove in the web thereof; means of rotating said gear, a point on the end of said guiding-arm engaging with the spiral groove in the web of the said rotating gear, means of raising said reproducer-point clear of the record, consisting of a cam on the said gear; a knee on the said guiding-arm, connected by a cord and bell-crank levers to a tension-weight which carries the reproducer-point, the said tension-weight, a lever mounted therein having a reproducer-point on one end thereof, and being connected at its opposite ends by means of a cord to a diaphragm; the said diaphragm, means of disengaging the guiding-point from the groove in the rotating gear, consisting of a cam on the said rotating gear, to engage with the knee which carries the guiding-point, all substantially as and for the purposes set forth.

25. In a phonograph, the combination with a rotating record-table, a horizontally-swinging reproducer-arm, a bracket on the end of said arm, a tension-weight mounted in said bracket, said tension-weight carrying a reproducer-lever, having a reproducing-point on one end thereof, and the opposite end thereof connected by means of a cord with a diaphragm, and the said diaphragm; means of causing said reproducer-point to follow the record, and means of raising said reproducer-point clear of the record, substantially as shown and described.

26. In a phonograph, the combination with a rotating record-table, a horizontally-swinging reproducer-arm, a bracket on the end of said arm, a tension-weight mounted in said bracket, said tension-weight carrying a lever, having a reproducing-point on one end thereof, and the opposite end thereof connected by means of a cord with a diaphragm, and the said diaphragm; means of causing said reproducer-point to follow the record, and means of raising said reproducer-point clear of the record, consisting of a cam on a rotating gear, a knee to engage with said cam, and cords connecting the said knee through bell-cranks with a bell-crank on the end of said tension-weight, substantially as shown and described.

27. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a record-reproducer and means of causing said reproducer to follow the record, consisting of a vertical spindle a swinging guiding-arm rigidly fastened

through the vertical spindle to said reproducer-arm, a rotatable gear with a spiral groove in the web thereof, and means of rotating said gear, and a point on the end of said guiding-arm engaging with a spiral groove in the web of the said rotating gear, of means of raising said reproducer-point from the record, means of causing the said reproducer-arm to return to the center of the record to begin a new reproduction; and means of holding said reproducer-point away from the record, during this returning movement; said means consisting of a knee on the end of the said guiding-arm, a cam on said rotating gear to engage said knee and raise the reproducer-point, a spring fastened to said guiding-arm, adapted to engage with a lug on said knee and hold said knee until the spring shall have disengaged therefrom, and a coil-spring fastened to said vertical spindle and to the base-plate, all substantially as shown and described.

28. In a phonograph, the combination with a rotating record-surface, a horizontally-swinging arm, a reproducer-point on the free end thereof, means of causing said point to follow a record on the said surface, said means consisting of a directing-spiral exterior to the said surface and a point guided by the said spiral and means of connecting the said point with the reproducing-point, substantially as shown and described.

29. In a phonograph, the combination with a record, a swinging reproducer-arm, a reproducer-point movably attached to said arm and means of causing said point to follow a record, of means of raising said point with reference to said reproducer-arm to disengage the said point from the record, substantially as shown and described.

30. In a phonograph the combination with a record and means of operating same, a swinging reproducer-arm and means of guiding same, of a reproducer-point so attached to the reproducer-arm that it has an independent motion at right angles to the plane of motion of the reproducer-arm, and means of controlling this motion to raise the point clear of the record substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN D. BLAGDEN.

Witnesses:

T. D. YOUNG,
LEE THORNTON.