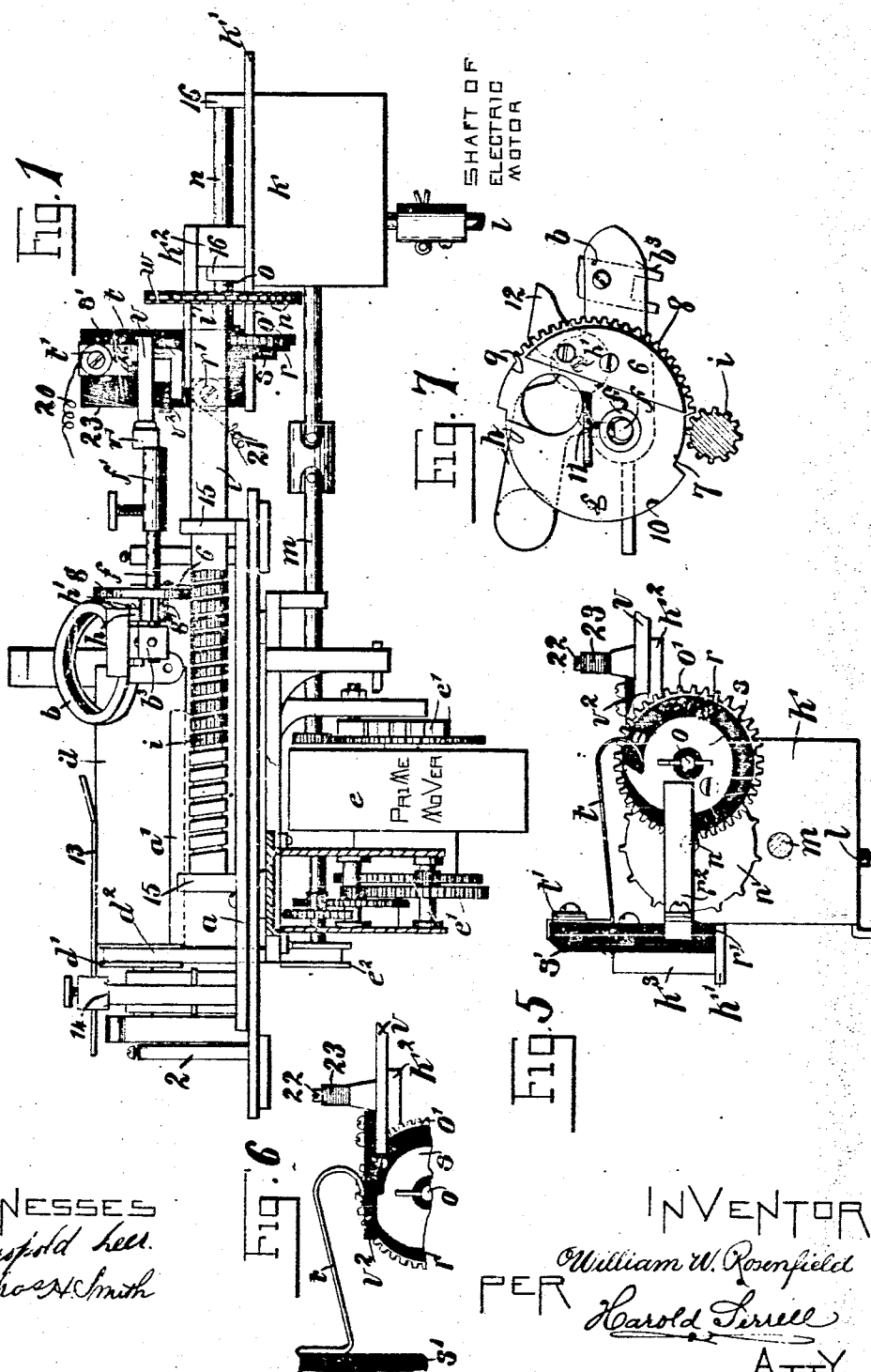


No. 879,589.

W. W. ROSENFELD. PATENTED FEB. 18, 1908.
PHONOGRAPH.

APPLICATION FILED AUG. 5, 1904.

2 SHEETS—SHEET 1



No. 879,589.

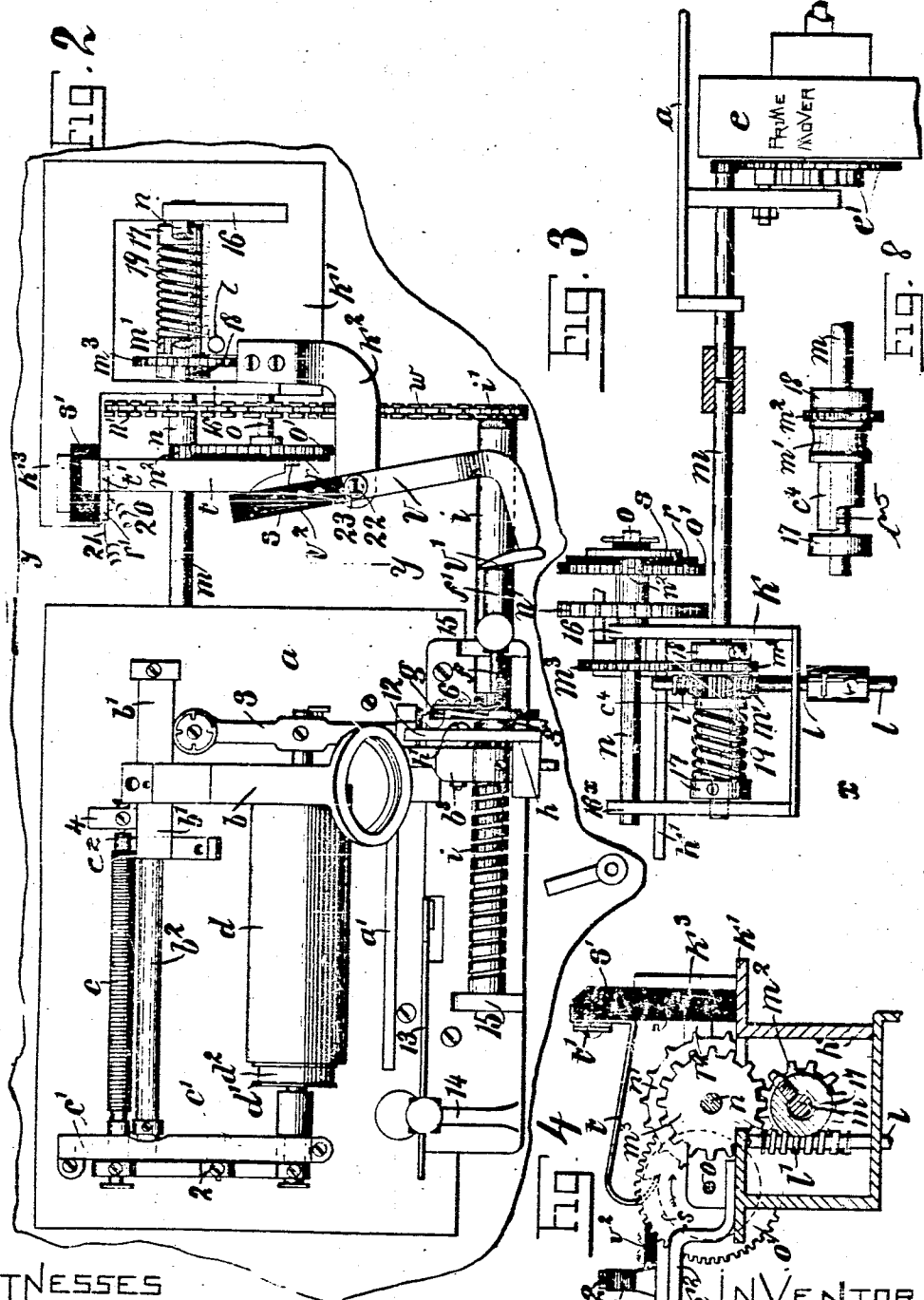
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2 SHEETS—SHEET 2.



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WILLIAM W. ROSENFELD, OF NEW YORK, N. Y.

PHONOGRAPH.

No. 879,589.

Specification of Letters Patent.

Patented Feb. 18, 1908.

Application filed August 5, 1904. Serial No. 219,599.

To all whom it may concern:

Be it known that I, WILLIAM W. ROSENFELD, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented an Improvement in Phonographs, of which the following is a specification.

This invention relates to automatically operated phonographs.

The invention has been made especially with the idea of adapting a spring motor actuated phonograph to operate to make successive productions of a record or records. To this end I provide means for automatically re-winding the motor by which the phonograph is given its reproducing movements, and means for automatically raising the reproducer from the record and for returning the parts to normal or starting position. For re-winding the spring motor, I preferably provide an electric motor and means whereby the circuit is closed to such electric motor to cause the re-winding of the spring motor preferably after the reproduction of a record, and the electric motor also preferably actuates the automatic return mechanism.

Phonographs operated by spring motors are now in common use, but other forms of stored power motors might be employed for directly actuating phonographs for their reproducing movements, and this invention, so far as it relates to the feature of automatically re-winding or otherwise storing power in an actuating motor of a phonograph, considered broadly, is not to be limited to any particular form of such motor.

In the drawings Figure 1 is an elevation and Fig. 2 a plan representing a spring motor actuated phonograph of well known form provided with rewinding and return mechanism in accordance with my present invention. Fig. 3 is an elevation of parts of the operating mechanism looking from the back of Figs. 1 and 2. Fig. 4 is a transverse section and elevation at the dotted line *x, x*, of Fig. 3. Fig. 5 is an elevation and partial section on dotted line *y, y* of Fig. 2 looking toward the right. Fig. 6 is an elevation representing some of the parts shown in Fig. 5, but in a different position. Fig. 7 is an elevation in larger size of the eccentric disk and the parts associated therewith looking toward the left in Figs. 1 and 2; and Fig. 8 is an elevation of the friction coupling interposed between the shafts of the electric motor

and the motor for directly operating the phonograph with the friction spring omitted.

As shown in Figs. 1 and 2, *a* represents the bed of the phonograph; *a'* the support rail for the free end of the reproducer-arm *b* which is carried by a sleeve *b'* movable on a guide-bar *b''*. *c* represents the feed-screw, and *c'* the feed nut carried by the sleeve *b'* and engaging the underside of the feed screw for causing the reproducing movement of the reproducer-arm; *d* represents the mandrel; *e'* gears within a case or housing connecting the shaft of the mandrel *d* with the shaft of the feed-screw *c*, and 2, 3, 4 are bearings for the respective ends of the shaft of the mandrel and feed-screw. *d'* is a pulley on the mandrel shaft and *d''* a belt around the same and which extends down through the bed *a* to a pulley *e''* upon a shaft of the train of gears *e'* of a spring motor *e*, by which the mandrel is rotated and the reproducer-arm moved for the reproduction of a record. These parts are of usual and well known construction, and do not require further description.

Secured to the reproducer-arm *b* (see especially Fig. 7) is a bracket-arm *b''* which carries an arbor *f* upon which an eccentric disk *g* is revoluble. The arbor *f* also supports an adjustable sleeve *f'* clamped thereto by the set-screw shown in Figs. 1, 2 and 7, the office of which sleeve will be hereinafter described.

The eccentric or cam disk *g* is provided with a notched hub *g'*, and has secured to its face a weight-plate 6, and its periphery is formed with a notch or low portion 7, with a toothed portion 8 beyond the low portion 7 and extending to a high portion, with a tail-rib 9 beyond the toothed portion, and with a portion 10 which is smooth. Pivotally connected to the bracket-arm *b''* is a latch *h* having a tooth 11 for engaging the notch in the hub *g'*, said latch *h* being weighted or over-balanced by reason of the position of its pivot *h'* so that its tooth 11 normally bears against the hub *g'*. Said arm also has an end 12 on the other side of the pivot from the tooth 11 for engaging a cam rod or arm 13 adjustable longitudinally on a support 14 secured to the bed *a* of the phonograph.

A return feed screw *i* is mounted in bearings 15 upon the bed of the phonograph. This screw shaft preferably has a spiral groove of coarse pitch compared with the

thread of the feed screw *c* and is provided with teeth between the convolutions of the groove for a portion of its length. The shaft of the return feed screw carries fast thereon a sprocket *i*.

l represents the shaft from an electric motor, positioned vertically, and having at its upper end a worm *l'* meshing with a gear *m'* mounted free to rotate upon a shaft *m* extending horizontally and having bearings in the sides of a casing *k*. The gear *m'* is formed with a gear *m²*, and these together are loose upon the shaft *m*. The shaft *m* is driven by the rotation of the gear *m'* through a slip coupling which will permit the gear to slip on the shaft when a certain resistance is offered to the rotation of the shaft. Any suitable form of friction coupling, or driving device, may be provided for this purpose. In the preferred form of friction coupling shown, a collar 18 is mounted fast on the shaft *m* at one side of the gears *m'* and *m²*, and at the other side of said gears is a collar 17 also fast on the shaft, while between the collar 17 and the gears is a notched flanged sleeve *c'* held against rotation relatively to the shaft *m* by a pin *c* passing through the shaft and pressed against the face of the gear *m'* by a helical spring 19 one end of which bears against the collar 17 and the other end against the flange of the sleeve *c'*. (Figs. 3 and 8). The shaft *m* is continued by means of a coupling shown in Figs. 1 and 3, and terminates in a pinion meshing with a gear through which the spring motor *e* may be rewound.

A shaft *n* is mounted above the shaft *m* in bearings 16. Fast on this shaft is a gear *m³* meshing with the gear *m²*; also fast on this shaft *n* is a sprocket *n'*, a chain *w* passing around the sprocket *n'* and to and around the sprocket *i* on the shaft of the return feed screw for rotating said shaft. The shaft *n* also has fast thereon a pinion *n²* meshing with a gear *o'* mounted upon an arbor *o* which is secured in a lug of the casing *k*. A cam disk *s* of conducting material is mounted to rotate with the gear *o'* and is insulated from the gear *o'* and the arbor *o* by being mounted on an insulating disk *r* secured to the gear *o'*. A spring contact arm *t* for engaging the periphery of the cam disk *s* is secured by a binding-post clamp *t'* to an insulating post *s'* fast to a post *k³* rising from the top plate *k'* of the casing *k*. A contact spring *r²* which constantly bears against the face of the cam disk *s* is also secured by a binding-post clamp *r'* to the insulating-post *s'*. To the binding-post clamps *t'* and *r'* are connected wires 20 and 21 respectively of the circuit to the electric motor, so that in the operation of the machine when the contact arm *t* engages the cam disk *s* the circuit will be closed for operating the motor.

The contact arm *t* is normally held out of

contact with the cam disk *s* by means of a rocker arm *v* pivoted at 22 to a bracket arm *k²*. One end of this rocker arm is provided with an insulating block *v²* adapted to move beneath the contact arm *t* when the latter has been raised by the high point of the cam disk *s*, and the rocker arm is under tension of a spring 23 which tends to swing the rocker-arm on its pivot to move the block *v²* toward and beneath the end of the contact arm. The other end of the rocker arm is provided with a foot piece *v'* which lies in the path of movement of the sleeve *f'* carried by the arbor *f* in position to be engaged thereby as the reproducer arm approaches the end of its reproducing movement.

The position of the parts as shown in Figs. 1 and 2 is that assumed by them at the end of the reproducing movement of the phonograph preparatory to the return of the reproducer arm to an initial or original position either to repeat the record or to reproduce from another record. In these figures the position of the rocker-arm *v* and the spring contact-arm *t* is as represented in Fig. 5, while the position of these parts during the reproduction of the record and before the arbor *f* and its sleeve *f'* reach the limit of their movement is that represented in Fig. 6—that is to say—with the insulating-block *v²* moved beneath and supporting the free end of the spring-arm *t* in which position the electric circuit is broken and the electric motor not running.

As shown in Figs. 1 and 2, the extreme advance movement of the reproducer-arm and arbor *f* have brought the end of the sleeve *f'* in contact with the foot-piece *v'* and the rocker-arm *v* has been thereby swung on its pivot to remove the insulating-block *v²* from beneath the end of the spring-arm *t*, allowing the same to drop into contact with the periphery of the cam-disk *s* so as to complete the electric circuit through the wire 20, binding post clamp *t'*, arm *t*, cam-disk *s*, contact spring *r²*, binding-post clamp *r'* and wire 21, thereby starting the electric motor. The insulating block *v²* is then held against the side of the arm *t* by the action of the spring 23 until the arm *t* is again raised by the cam disk *s* to permit the block *v²* to again move beneath the arm *t*. The electric motor being thus started, the rotation of the shaft *l* and worm wheel *l'* drives the gears *m'*, *m²* together, and the shaft *m* is frictionally driven through the friction coupling formed by the collars 17 and 18, the sleeve *c'* and the spring 19, thereby winding up the spring motor *e*. Simultaneously the gear *m²* causes the rotation of the gear *m³* and the shaft *n*, which through the sprocket *n'*, the chain *w* and the sprocket *i* drives the return feed screw *i*, and the shaft *n* through the pinion *n²* also rotates the gear *o'* and the cam-disk *s*, these parts being so timed and

proportioned that the cam-disk is not given a complete rotation until the return feed screw has been given a rotation more than sufficient to effect the raising of the reproducer-arm and its complete return movement and lowering again to its operative position.

When the return feed screw *i* begins to rotate, the teeth thereof engage and mesh with the teeth *s* of the eccentric disk *g* (see Fig. 7) and the disk is thereby rotated to cause successive portions of its toothed cam periphery to engage the return feed screw thereby raising the bracket arm *b* and reproducer-arm *h* to raise the reproducer from the record and move the feed nut from the feed screw *c* until the teeth *s* have paid out and the tail-rib 9 of this eccentric-disk has settled into the groove of the return feed screw *i*. The tooth 11 of the latch *h* then drops into the notch of the hub *g'* and holds the eccentric disk against further turning, and the disk, the arm *b* and the reproducer arm *h* are then by the continued rotation of the return feed screw given a return movement until the end 12 of the latch *h* under-runs the bent end of the arm 13 whereby the end 12 of the latch is pressed down and the tooth 11 withdrawn from the notch in the hub *g'*. The eccentric disk *g* is thereby released and resting on the return feed screw it is turned thereby to bring successive portions of the portion 10 of its cam periphery in engagement with the shaft, whereby the bracket arm *b* and the reproducer-arm are gradually lowered until the reproducer is returned to operative position and the feed nut is again in engagement with the feed screw *c*. The turning of the disk *g* will continue until its periphery clears the return feed screw, after which, during any further rotation of the return feed screw and during the next reproducing movement of the reproducer-arm, the disk will be held by the weight 6 in position with its low portions 7 opposite the return feed screw and with the shoulder formed by the first of its teeth 8 bearing against the return feed screw ready to be engaged by the teeth of the return feed screw when the latter is rotated for the next return movement.

The rotation of the return feed screw continues until the end of the contact arm *t* is raised by the cam disk *s* to permit the block *v* of the rocker arm *e* to move under the end of the contact arm and until the high point of the cam disk has then moved beyond and out of contact with the contact arm, thereby breaking the circuit and stopping the electric motor.

To insure the full return movement of the reproducer arm, the amount of rotation given to the return feed screw is preferably, and as before pointed out, more than sufficient to effect the operation, return and lowering of the reproducer arm with the longest

record which the machine is adapted to reproduce. The return feed screw will thus continue to rotate after the reproducer arm has been returned and lowered; and to prevent the eccentric disk *g*, which then rests with the first of its teeth 8 bearing against the return feed screw, from being turned by such further rotation of the return feed screw, the portion of the return feed screw against which the disk *g* then rests is circumferentially smooth, the gear teeth of the return feed screw extending only for a part of the length of the screw from the other end thereof.

If the spring motor *e* is allowed to continue in operation after the return of the reproducer arm and the feed nut to operative position, the phonograph will be again actuated thereby for again reproducing the record, the electric motor meanwhile remaining at rest until the reproducer arm nears the end of its reproducing movement, at which time the sleeve *f'* will again engage the foot piece *v'* to swing the rocker arm *v* to carry the block *v'* from under the contact arm *t* and permit the contact arm to spring into contact with the periphery of the cam disk *s*, thereby again closing the circuit for causing the electric motor to operate to rewind the spring motor and to rotate the return feed screw for again returning the reproducer arm to its initial or starting position. Evidently, however, suitable means may be provided for stopping the operation of the spring motor before the return movement of the reproducer arm has been completed, and when such means is provided the entire mechanism will remain at rest after the return movement of the reproducer arm has been completed and until the spring motor is again put in operation, whereupon the reproducing and return movements of the phonograph and the rewinding of the spring motor will again be effected in order and repeated until the spring motor is again stopped.

By adjustment of the sleeve *f'* and the cam rod 13, the extent of operation of the spring motor before being rewound may be varied, and the mechanism shown may be adapted for records of varying length so that the reproducing devices shall operate only over the length of the actual record, thus avoiding waste of time and unnecessary movement of the parts.

To insure full rewinding of the spring motor with the longest record which the machine is adapted to reproduce, the amount of rotation given to the worm gear *m'* at each operation of the electric motor will preferably be more than sufficient to rewind the spring motor to the tension to which it was wound before the commencement of the reproducing movement, and the friction coupling between the worm gear and the re-

winding shaft *m* is provided for the purpose of permitting continued movement of the worm gear after the spring motor has been fully re-wound, the resistance to the rotation of the shaft *m* being sufficient to cause the parts of the coupling to slip.

It will be seen that with the construction shown, the return movement of the reciprocating part of the phonograph, that is the reproducer arm in the construction shown, is effected entirely by the power of the electric motor and does not add at all to the work to be performed by and cannot affect the operation of the spring motor.

It will be understood that the invention is not to be limited to the exact construction and arrangement of parts shown in the drawings and to which the foregoing description has been mainly confined, but that it includes changes and modifications thereof within the claims. It will be understood also that features of the invention may be employed independently of other features thereof, and that the invention or features thereof may be applied to other forms of phonographs from that shown.

It will be understood also that the term "phonograph" is used herein as a broad term to include all sound reproducing machines to which the invention is or may be found applicable.

Features of invention disclosed but not claimed herein are claimed in Patent No. 859,114 granted to me on an application filed as a division of this application, and in my pending applications No. 243,612 and No. 385,388.

I claim as my invention

1. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of means for automatically storing power in said motor in the interval between successive reproductions of a record or records, substantially as described.

2. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of means controlled by the movement of a part of the phonograph for automatically storing power in said motor, substantially as described.

3. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor, and means controlled by the movement of a part of the phonograph to cause power to be stored in the first motor by the operation of the second motor, substantially as described.

4. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor for storing power in the first motor, and automatically operated means for causing the second motor to operate in the interval between successive reproductions of a record or records, substantially as described.

5. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor for storing power in the first motor, and means controlled by the movement of a part of the phonograph for causing the second motor to operate in the interval between successive reproductions of a record or records, substantially as described.

6. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor and automatically operated means for causing power to be stored in the first motor by the operation of the second motor after the reproduction of a record, substantially as described.

7. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor for storing power in the first motor, means controlled by the movement of a part of the phonograph for causing the second motor to operate after the reproduction of a record, and adjustable means for varying the time at which the second motor is caused to operate with relation to the operation of the phonograph, substantially as described.

8. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor, and connections between the second motor and the first motor for storing power in the first motor by the operation of the second motor, said connections including means for permitting a slipping of the parts after the desired tension has been applied to the first motor, substantially as described.

9. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor, and connections between the second motor and the first motor for storing power in the first motor by the operation of the second motor, said connections including a friction driving device, substantially as described.

10. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of a second motor, connections between the second motor and the first motor for storing power in the first motor by the operation of the second motor, said connections including a friction driving device, and means for starting the second motor and for automatically stopping it after an operation more than sufficient to restore to the first motor the power exerted by the first motor in actuating the phonograph for the reproduction of a record, substantially as described.

11. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, and automatically operated means for causing power to be stored in the first motor by

the operation of the electric motor in the interval between successive reproductions of a record or records, substantially as described.

12. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, and means controlled by the movement of a part of the phonograph to cause power to be stored in the first motor by the operation of the electric motor, substantially as described.

13. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, connections for storing power in the first motor by the operation of the electric motor, and means for automatically closing the circuit to the electric motor after the reproduction of a record, substantially as described.

14. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, connections for storing power in the first motor by the operation of the electric motor, means for automatically closing the circuit to the electric motor after the reproduction of a record, and adjustable means for varying the time of closing the circuit with relation to the operation of the phonograph, substantially as described.

15. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, connections for storing power in the first motor by the operation of the electric motor, and means controlled by the movement of a part of the phonograph for closing the circuit to said motor, substantially as described.

16. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, connections for storing power in the first motor by the operation of the electric motor, means for closing the circuit to the electric motor, and means for automatically opening said circuit after a predetermined operation, substantially as described.

17. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, connections for storing power in the first motor by the operation of the electric motor, means controlled by the movement of a part of the phonograph for closing the circuit to said electric motor, and means for opening said circuit after the shaft of the electric motor has made a predetermined number of revolutions, substantially as described.

18. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, connections between the electric motor and the first motor for storing power in the first motor by the operation of the electric motor, said connections including means for permitting a slipping of the parts after the desired

tension has been applied to the first motor, automatically operating means for closing the circuit to the electric motor, and means for opening said circuit after the shaft of the electric motor has made a number of revolutions greater than is required to store power in the first motor, substantially as described.

19. The combination with a phonograph and a spring motor for actuating the phonograph in reproducing a record, of an electric motor, connections between the electric motor and the spring motor for rewinding the spring motor, said connections including means for permitting a slipping of the parts after the desired tension has been applied to the first motor, means for closing the circuit to the electric motor after the reproduction of a record, adjustable means for varying the time of operation of the circuit closing means for records of different lengths, and means for opening said circuit after the shaft of the electric motor has made a predetermined number of revolutions not dependent on the operation of the spring motor, substantially as described.

20. The combination with a phonograph and a spring motor for actuating the phonograph in reproducing a record, of an electric motor, and automatically operated means for causing the spring motor to be rewound by the electric motor after the reproduction of a record, substantially as described.

21. The combination with a phonograph and a spring motor for actuating the phonograph in reproducing a record, of an electric motor, connections between the electric motor and the spring motor for rewinding the spring motor, and means controlled by the movement of a part of the phonograph for closing the circuit of the electric motor, substantially as described.

22. The combination with a phonograph and a spring motor for actuating the phonograph in reproducing a record, of an electric motor, connections between the electric motor and the spring motor for rewinding the spring motor, means controlled by the movement of a part of the phonograph for closing the circuit to the electric motor after the reproduction of a record, and adjustable means for varying the time of closing the circuit with relation to the operation of the phonograph, substantially as described.

23. The combination with a phonograph having a reciprocating reproducer carrier and with a spring motor for actuating the phonograph in reproducing a record, of an electric motor, connections between the electric motor and the spring motor for rewinding the spring motor, and means controlled by the movement of the reproducer carrier for closing the circuit to the electric motor, substantially as described.

24. The combination with a phonograph and a spring motor for actuating the phono-

graph in reproducing a record, of means controlled by the movement of a part of the phonograph for rewinding the spring motor, substantially as described.

25. The combination with a phonograph and a spring motor for actuating the phonograph in reproducing a record, of a second motor and connections for rewinding the spring motor, and means controlled by the movement of a part of the phonograph for causing the second motor to operate after the reproduction of a record, substantially as described.

26. The combination with a phonograph and a spring motor for actuating the phonograph in reproducing a record, of a second motor, connections between the second motor and the spring motor for rewinding the spring motor, said connections including means for permitting a slipping of the parts after the desired tension has been applied to the spring motor, substantially as described.

27. The combination with a phonograph and a spring motor for actuating the phonograph in reproducing a record, of a second motor, connections between the second motor and the spring motor for rewinding the spring motor, said connections including a friction driving device, substantially as described.

28. The combination with a phonograph having a reciprocating reproducer carrier and with a motor for actuating the phonograph in reproducing a record, of a second motor for storing power in the first motor, and means controlled by the movement of the reproducer carrier for causing the second motor to operate after the reproduction of a record, substantially as described.

29. The combination with a phonograph having a reciprocating reproducer carrier and with a motor for actuating the phonograph in reproducing a record, of an electric motor, connections for storing power in the first motor by the operation of the electric motor, and means for closing the circuit to the electric motor when the reproducer carrier of the phonograph has reached a certain point in its reproducing movement, and adjustable means for determining the point in the reproducing movement of the reproducer carrier at which the circuit to the electric motor shall be closed, substantially as described.

30. The combination with a phonograph and a motor for actuating the phonograph in reproducing a record, of an electric motor, connections for storing power in the first motor by the operation of the electric motor, a circuit closing device for closing the circuit to the electric motor, a member adapted to be moved by the movement of the reproducer carrier of the phonograph as it approaches the end of its reproducing movement for causing the circuit to be closed by said circuit closing device, and means operated by the electric motor for causing the circuit to be opened by said circuit closing device, substantially as described.

31. The combination with a phonograph having a reciprocating reproducer carrier and with a motor for actuating the phonograph in reproducing a record, of an electric motor, connections between the electric motor and the first motor for storing power in the first motor by the operation of the electric motor, a cam disk of conducting material turned by the electric motor, a spring contact arm bearing against the cam portion of said disk, a contact device bearing against another portion of said disk, circuit connections with said contact arm and contact device for completing the circuit to the electric motor through said disk, a spring latch for entering beneath the contact arm when the latter has been raised by the cam disk, and means controlled by the movement of the reproducer carrier for moving said latch to release the contact arm, substantially as described.

32. The combination with a phonograph having a record and a reproducer carrier mounted to travel across the record in the reproducing operation and to be raised from the record and returned to its starting point, and a spring motor for actuating the phonograph during the reproducing operation, of automatic means operating in the intervals between the reproducing operations to rewind the said motor and return said reproducer carrier to its starting position.

Signed by me this 26 day of July 1904.

WM. W. ROSENFELD.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.