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4 SHEETS--SHEET 1.

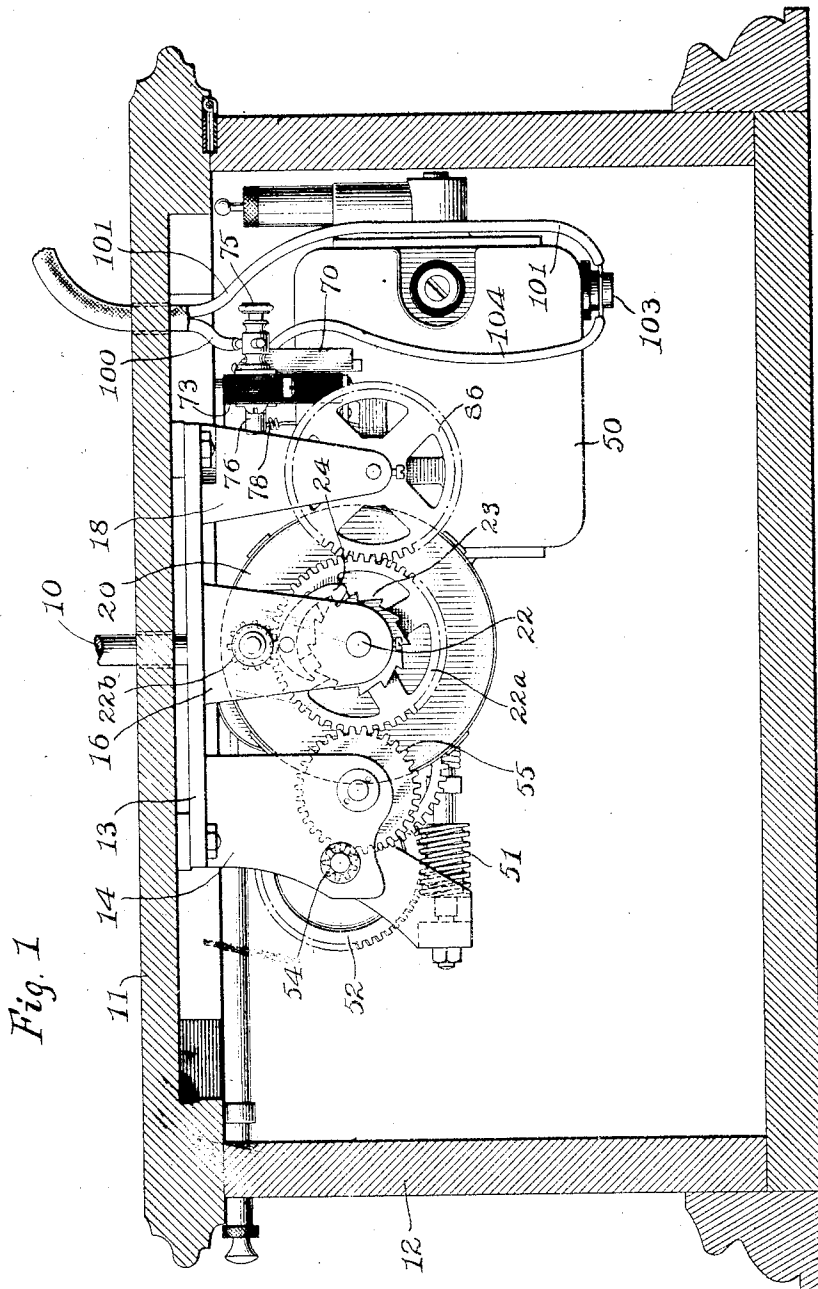


Fig. 1

Witnesses:
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W. P. PHILLIPS.
ELECTRICALLY DRIVEN WINDING APPARATUS FOR SPRING MOTORS.
APPLICATION FILED APR. 10, 1913.

1,085,477.

Patented Jan. 27, 1914.

4 SHEETS—SHEET 2.

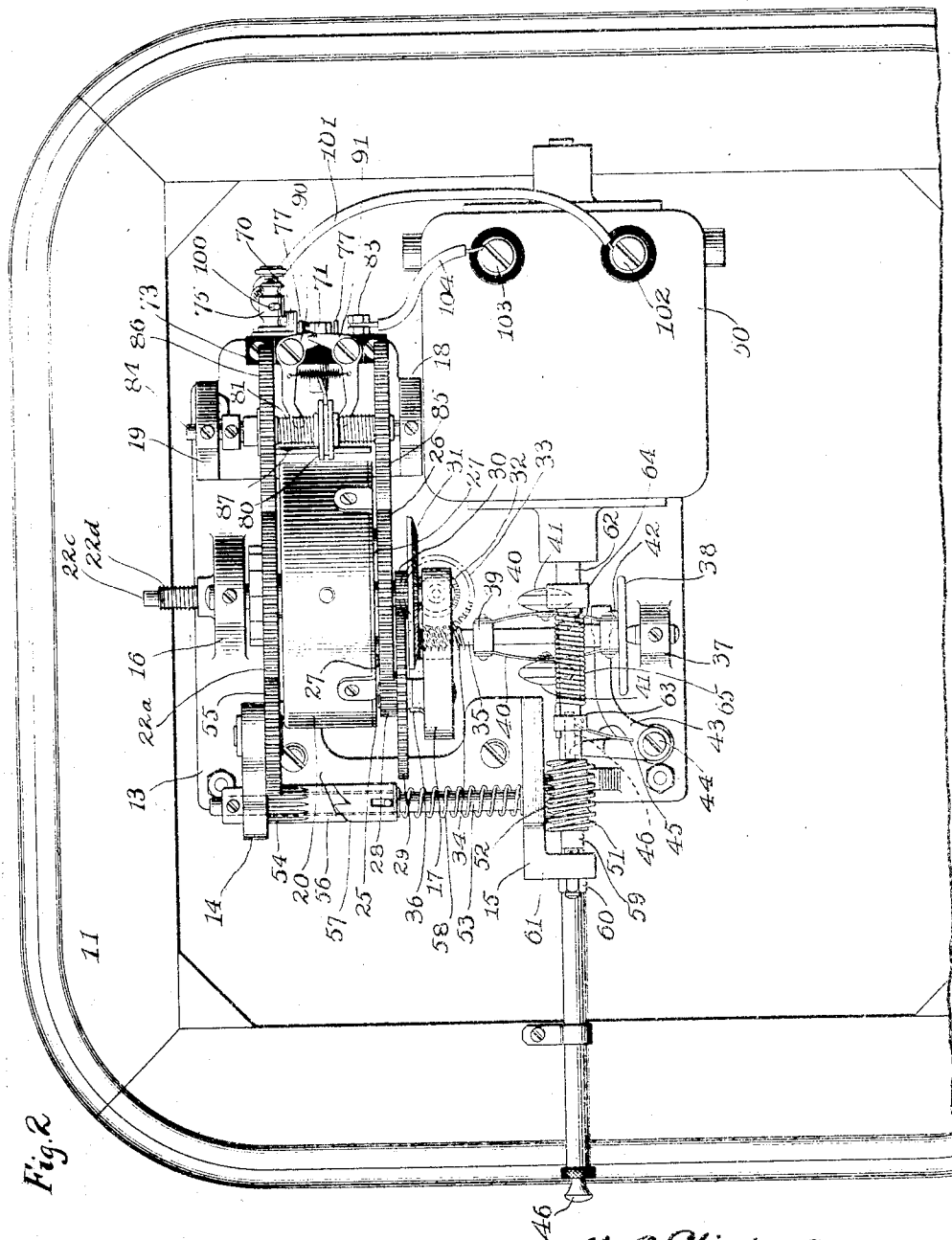


Fig. 2

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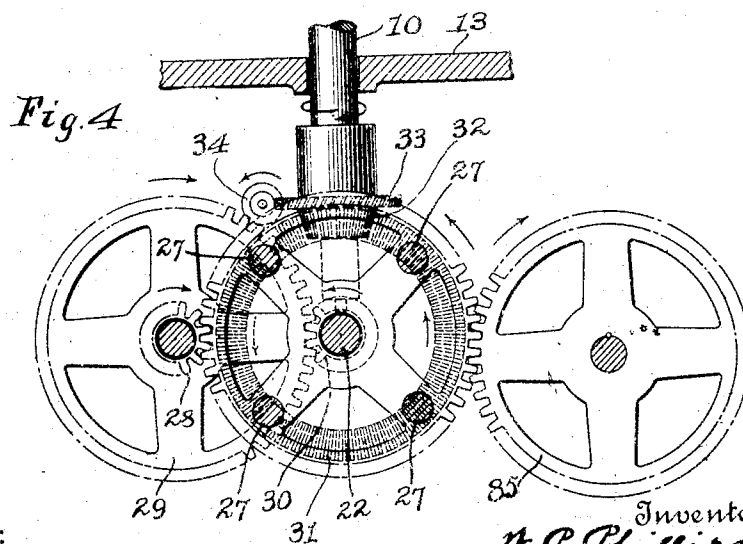
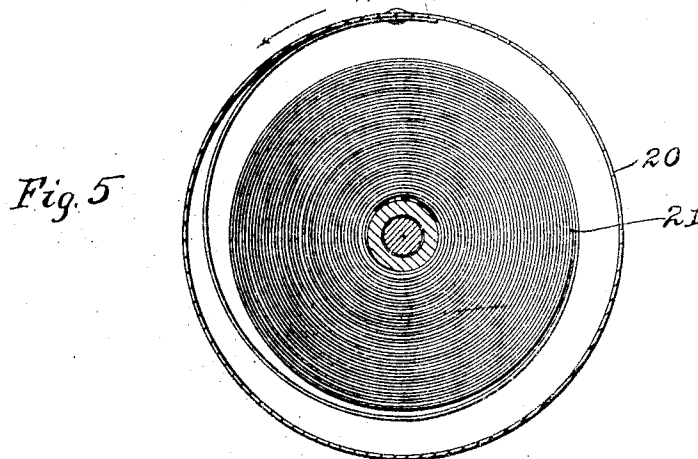
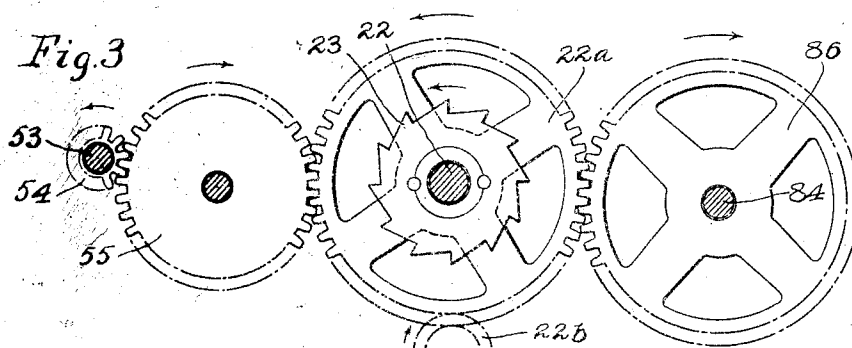
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4 SHEETS—SHEET 4.

Fig. 6

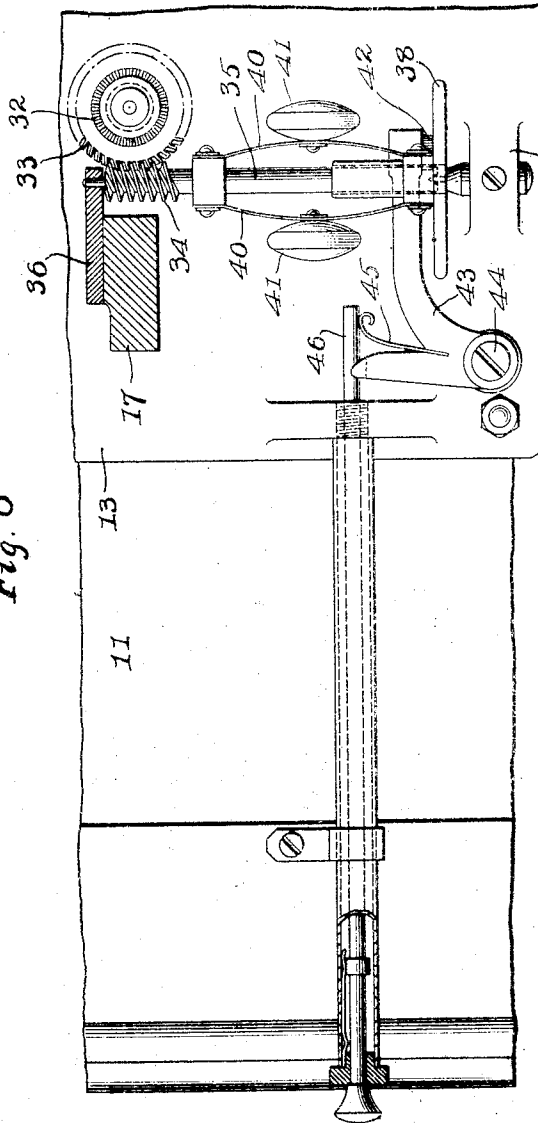


Fig. 8

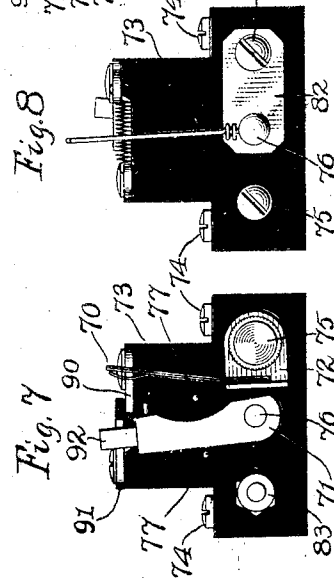


Fig. 7

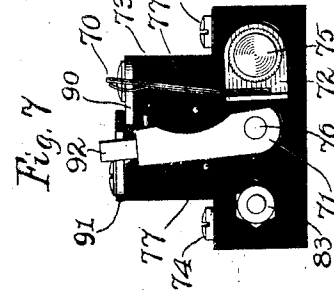


Fig. 9

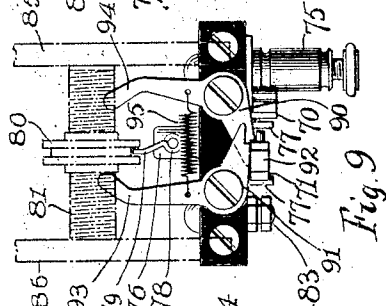
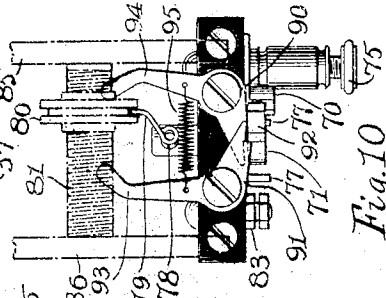


Fig. 10



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UNITED STATES PATENT OFFICE.

WALTER P. PHILLIPS, OF BRIDGEPORT, CONNECTICUT.

ELECTRICALLY-DRIVEN WINDING APPARATUS FOR SPRING-MOTORS.

1,085,477.

Specification of Letters Patent.

Patented Jan. 27, 1914.

Application filed April 10, 1913. Serial No. 760,305.

To all whom it may concern:

Be it known that I, WALTER P. PHILLIPS, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Electrically-Driven Winding Apparatus for Spring-Motors, of which the following is a full, clear, and exact description.

This invention relates to electrically-driven winding apparatus for spring motors, and its chief object is to provide improved mechanism for winding the motor spring periodically so that the spring will always be under sufficient tension to carry its load.

The invention consists in the novel features of construction and combinations of elements hereinafter described.

In the accompanying drawings I have illustrated the invention as applied to a small spring-motor, such as may be used for driving a phonograph, but it is to be understood that the invention is in no way limited to such application, since it can be used to advantage with any spring-motor, from the lightest to the most powerful, and without regard to the nature of the device, apparatus, or mechanism driven by the spring-motor.

Referring now to the drawings, Figure 1 shows the apparatus in side elevation. Fig. 2 is a bottom plan view. Figs. 3 and 4 are detail views, on a larger scale, of two trains of gears used in the apparatus. Fig. 5 is a side view of the motor spring, with the inclosing barrel or case in section. Fig. 6 is a detail bottom-plan view, on a large scale, of the spring-motor governor and the starting and stopping mechanism. Figs. 7 and 8 are detail front and rear views, on a large scale, of the electrical contact devices. Figs. 9 and 10 are detail plan views of the contact devices, showing certain parts in two different positions. These figures also show, in broken lines, certain parts which actuate the contacts to close and open the circuit of the winding motor.

The spring-motor which drives the vertical spindle or shaft 10 is suspended on the underside of the hinged lid 11 of the case 12 by means of a plate 13 provided with depending arms or brackets 14—15, 16—17, 18—19. The rotary barrel 20, which contains the spring 21, is mounted loosely on the shaft 22 journaled in the brackets 16, 17, and

is connected to the outer end of the spring, the inner end of the latter being attached to the shaft. For the purpose of winding the spring by hand, one end of the shaft 22 is provided with a large winding gear 22^a meshing with a pinion 22^b on a short shaft 22^c mounted in the bracket 16. This shaft 22^c has its outer end threaded, as at 22^d, to receive a suitable key or crank. To prevent backward rotation of the winding shaft 22, it is provided with the usual ratchet 23 engaged by a pawl 24 pivoted on the adjacent bracket 16. A removable cover 25 on the barrel 20 affords access to the inclosed spring when necessary.

Rotatably mounted on the shaft 22 is a large driving gear 26; provided, near its periphery, with a plurality of friction disks 27 which bear on the adjacent side of the barrel and transmit the rotation thereof to the gear. The latter meshes with a pinion 28 journaled on the bracket 17 and fixed to a co-axial gear 29 which meshes with a pinion 30 loose on the shaft 22. The latter pinion is rigidly fastened to a bevel gear 31, also loose on the shaft 22, which drives a bevel pinion 32 on the aforesaid vertical shaft or spindle 10 journaled in the bracket 17 and extending through a suitable aperture in the hinged lid 11. By the train of gearing described the slow rotation of the barrel 20 under the influence of the spring 21 is multiplied to give the spindle 10 a relatively high speed. The spindle 10 also has a worm gear 33 meshing with a high-pitched worm 34 on a horizontal governor shaft 35, rotatably mounted between an arm 36 on the bracket 17 and a bracket 37 depending from the base plate 13, so that the speed of the spindle is multiplied in the governor shaft and the latter therefore driven at a high speed. A friction disk 38, rotatable with but slidable on the governor shaft 35, is connected to a collar 39, fixed on the shaft, by a pair of blade springs 40 carrying balls or weights 41. As the shaft rotates, the revolving weights fly out under the influence of centrifugal force and flex the springs, thereby drawing the governor disk 38 against the friction pad 42 carried by the arm 43. The latter, pivoted at 44 on the base plate 13, carries a spring 45 extending into engagement with a sliding controlling rod 46 suitably mounted on the lid 11 and plate 13. When the rod 46 is pushed in the spring 45

is given its maximum tension, which causes the pad 42 to exert on the disk 38 a friction too great for the motor-spring 21 to overcome; but when the rod is pulled out the tension of spring 45, is relieved and the motor can start. As the speed of the governor shaft 35 increases from zero the disk 38 swings the arm 43 counterclockwise (as seen in Figs. 2 and 6) and flexes the spring 45 more and more, against the end of the rod 46. Eventually the resulting pressure of the pad 42 on disk 38 prevents further increase of speed, after which the speed of the spindle 10 remains practically constant. Manifestly, the constant speed of the spindle 10 depends upon the position of the inner end of the adjustable rod 46.

The electric motor 50, which winds the motor-spring 21 periodically, is suspended from the plate 13 in any convenient manner, and its armature shaft is connected to the winding shaft 22 through the medium of a worm 51 meshing with a worm gear 52 fixed on a shaft 53, which is journaled at one end in the bracket 15 and at the other in the bracket 14. The shaft 53 carries and rotates a pinion 54 meshing with a gear 55 which in turn meshes with the winding gear 22^a. Thus the very high speed of the electric motor 50 is reduced to a relatively low speed at the winding shaft 22. Obviously, manual winding of the spring in the manner previously described will rotate the pinion 54; and to prevent the rotation of the latter from being communicated to the electric motor 50 the pinion 54 is connected to the shaft 53 by a suitable clutch having one member, 56, formed on the end of the pinion and the other member, 57, slidably but non-rotatably mounted on the shaft. A spring 58 encircling the shaft 53 urges the clutch members together.

To eliminate the shock, on the mechanism connecting the winding motor 50 with the spring 21, which would otherwise result from the suddenness with which the motor 50 starts when its circuit is closed, a yielding connection is provided between the worm 51 and the motor. For this purpose the armature shaft is made in two parts, one part, 59, carrying the worm 51 and supported at one end by a pivot-screw 60 mounted in an arm 61 on the bracket 15 and extending into the end of the shaft. The other part 62, of the armature shaft, is tapered to support the adjacent end of the part 59. On the shaft-parts are fixed two collars, 63, 64, to which are connected the ends of a coil spring 65 encircling the part 59.

The electric winding motor 50 is connected to the external source of current (not shown) through a pair of contacts 70, 71. The first named contact is in the form of a blade spring fixed at one end to a bracket 72 mounted on an insulating block 73 de-

pending from and fixed to the plate 13 by screws 74. The bracket 72 also carries a binding post 75 by which it may be connected to the external circuit. The other contact is fixed to a shaft 76, pivotally mounted in the insulating support 73, and plays between a pair of stops 77. At the end of the shaft 76 opposite to the end on which the contact 71 is fixed is a vertical arm 78 in the form of coil spring having a horizontal finger 79 extending into a circumferential groove in a collar 80 threaded on a horizontal endless screw 81. Assuming the collar 80 to be non-rotatable on the screw, it will be seen that if the screw is rotated so as to move the collar to the right (as viewed in Figs. 9 and 10) the spring arm 78 will tend to swing the contact 71 toward the contact 70. If the contact 71 is then held against such movement the spring arm 78 will be tensioned, with result that when the contact is released it will snap quickly into engagement with the other, as in Fig. 10. This closes the motor circuit, since the contact 71 is connected by the shaft 76 to a plate 82, mounted on the block 73 and carrying a binding post 83 by which it may be connected to a terminal of the motor 50.

The screw 81, which shifts the collar 80 and so swings the contact 71 back and forth through the medium of the spring actuating arm 78, is rotatably mounted on a horizontal shaft 84 journaled in the brackets 18, 19, and is fixed at one end to a gear 85, also loose on the shaft, and meshing with the driving gear 26. Hence when the spring motor is running and the gear 26 is therefore rotating, the screw 81 is rotated to carry the collar 80 toward the right (as seen in Figs. 9 and 10). At the other end of the shaft 84 is a gear 86, fixed to the shaft and meshing with the winding gear 22^a. The gear 86 has a long finger 87 extending through an aperture in the side of the collar 80. Remembering that the gear 22^a does not rotate (except during the winding operation) it will be evident that the finger 87 holds the collar against rotation when the gear 85 is rotating the screw 81 but permits the collar to move along the screw. On the other hand, when the gear 86 is rotated (by the motor 50 through the agency of the worm 51 and the gearing connecting the worm to the gear 22^a) at a faster rate than gear 85 or while the latter gear is stationary, the finger 87 turns the collar 80 on the screw 81 and so moves the collar toward the left as seen in Figs. 9 and 10. If the contact 71 is held in engagement with contact 70 while the collar is moving toward the left, thereby tensioning the spring arm 78, and is suddenly released it will be snapped instantly away from the contact 70, thereby breaking the motor circuit.

For the purpose of holding the swinging contact 71 and releasing it when the collar

80 reaches suitable points in its path, the block 73 is provided at its bottom (its top as seen in Figs. 9 and 10) with a pair of inwardly disposed pivoted detents 90, 91, formed with shoulders to engage a finger 92 on the contact 71 and with arms 93, 94 extending into the path of the collar 80. A spring 95, connected to the arms 93, 94, urges the arms toward each other and tends to swing the detent shoulders into the path of the finger 92. When the parts are in the positions shown in Fig. 10, with the circuit of motor 50 closed, the finger 92 is at the right of the shoulder on detent 91 and hence the contact 71 is held in engagement with contact 70. The motor 50 is therefore, running, the shaft 22 is being rotated to wind up the spring 21, and the collar 80 is being moved to the left (as seen in Fig. 10). At the same time the finger 92, bearing on detent 90, holds the latter in retracted position against the tension of spring 95. As the collar 80 moves toward the left from the position shown in Fig. 10, it eventually reaches the arm 93 and begins to swing the detent 91 out of the path of the finger 92. Just as the spring 21 is fully wound up, the detent 91 escapes the finger 92, and the spring arm 78, tensioned by the leftward movement of the collar 80, throws back the contact 71 and breaks the motor circuit. By this time the finger 92 has passed the shoulder of detent 90, permitting the spring 95 to swing the detent outwardly and bring the latter's shoulder into the path of the finger, as in Fig. 9. The motor circuit having been broken, the gear 86 ceases to rotate, but the gear 85 continues to rotate thereby causing the collar 80 to retrace its path. This tensions the spring arm 78 in the opposite direction, since the contact 71 is now held by the detent 90; but when the collar engages the arm 94 and retracts the detent from the path of the finger 92 the aforesaid arm snaps the contact 71 forward into engagement again with the contact 70. The motor circuit is thus re-closed, with the parts again in the positions shown in Fig. 10.

From the foregoing it will be seen that when the motor-spring 21 unwinds to a certain point the circuit of the winding motor 50 is closed and the spring is then wound up to a certain tension, whereupon the circuit of the motor 50 is broken; these operations being repeated at regular intervals as long as the winding motor is connected with the source of current and the spring-motor is permitted to operate.

The wiring of the apparatus is shown in Figs. 1 and 2, in which it is seen that the conductor 100, from the source of current or external circuit is connected to the binding post 75, while the other conductor, 101, is connected to the motor terminal 102. The

other motor terminal, 103, is connected by a wire 104 to the binding post 83.

It is to be understood that the invention is not limited to the apparatus herein specifically described, but can be embodied in other forms without departure from its proper spirit and scope as defined by the appended claims.

I claim:

1. The combination with a spring motor and its winding mechanism, of an electric motor connected with the winding mechanism to actuate the same, contacts in circuit with the electric motor, means for moving one of said contacts toward and from the other, a device connected with said means and movable in two directions to actuate the same, means actuated by the spring motor to move said device in one direction and by the electric motor to move the said device in the other direction.

2. The combination with a spring-motor and its winding mechanism, of an electric motor connected with the winding mechanism to actuate the same, contacts in circuit with the electric motor, a spring connected with one of the contacts to move the same relatively to the other contact, detents arranged to hold the movable contact in open and in closed position, a shiftable device connected with said spring and movable in two directions to tension the spring, means actuated by the spring motor to shift the said device in one direction and by the spring motor to shift the device in the other direction, and means in the path of said device and actuated thereby to disengage the detents from the movable contact.

3. The combination with a spring motor and its winding mechanism, of an electric motor connected with the winding mechanism to actuate the same, a pair of contacts in circuit with the electric motor, a spring connected with one of the contacts to move the same into and out of engagement with the other, a device connected with the spring and movable in two directions to tension the spring, a screw on which the said device is threaded, means actuated by the spring motor to rotate the screw in the device and thereby cause the device to move in one direction, means actuated by the electric motor to rotate the device on the screw and thereby cause the device to move in the opposite direction, and detents arranged to hold the movable contact in open and in closed position and releasable by the said movable device at appropriate points in the latter's path.

4. The combination with a spring-motor and its winding mechanism, of an electric motor connected with the winding mechanism to actuate the same, an endless screw connected with the spring motor for rotation thereby, a collar threaded on the screw,

means connected with the winding mechanism and with the collar to rotate the collar on the screw, and means controlled by the collar to make and break the circuit of the electric motor.

5 5. The combination with a spring-motor and its winding mechanism, of an electric motor connected with the winding mechanism to actuate the same, an endless screw, a gear fixed to one end of the screw to rotate the same, a gear driven by the spring-motor and meshing with the first-named gear, a collar threaded on the endless screw, a gear at the other end of the screw, a finger connecting the collar with the last-named gear to rotate the collar on the screw and permit axial movement of the collar, a gear driven by the electric motor and meshing with the last-named gear to rotate the same, and means controlled by the axially moving collar to make and break the circuit of the electric motor.

6. The combination with the spring barrel and the winding shaft of a spring motor, of a winding gear connected with the winding shaft, a driving gear connected with the barrel, a gear meshing with the winding gear, an axially movable collar connected with the last-named gear for rotation thereby, an endless screw on which the collar is threaded, a gear connected with the screw to rotate the same, with the aforesaid driving gear for rotation thereby, an electric motor connected with the winding gear to rotate the same, and means controlled by the aforesaid axially movable collar to make and break the circuit of the electric motor.

7. The combination with the winding shaft and the spring-barrel of a spring motor, of a winding gear connected with the winding shaft to rotate the same, a driving gear connected with the spring-barrel for rotation thereby, an endless screw, a gear fixed to the screw and meshing with the driving gear, a shaft on which the screw is rotatably mounted, an axially traveling collar threaded on the screw, a gear fixed on the last-named shaft and connected with the collar to rotate the same and permit axial movement thereof, an electric motor connected with the winding gear to rotate the same, and means controlled by the axially traveling collar to make and break the circuit of the electric motor.

8. The combination with a spring motor, of an electric winding motor connected with the former, a pair of contacts in circuit with the electric motor, a spring connected with one of the contacts to shift the same to and from the other, a device connected with the spring and movable in one direction by the spring motor and in another direction by the electric motor to tension the spring correspondingly, a detent engageable with the shiftable contact to hold the same away

from the other against the tension of said spring, means, actuated by movement of the aforesaid device in one direction, to disengage said detent from the shiftable contact, a detent engageable with the shiftable contact to hold the same against the other against the tension of said spring, and means, actuated by movement of the aforesaid device in the other direction, to disengage the last-named detent from the shiftable contact.

9. The combination with a spring-motor, of an electric winding motor connected therewith, a stationary contact and a movable contact in circuit with the electric winding motor, a spring connected with the movable contact to actuate the same, a reciprocating traveling element connected with the spring to tension the same in opposite directions, a pair of detents separately engageable with the movable contact to hold the same in closed and in open position against the tension of said spring, arms connected with the detents and arranged in the path of said traveling element and on opposite sides of the latter for actuation thereby to disengage the detents alternately from the movable contact, means for urging the detents into the path of the movable contact, and means actuated alternately by the spring-motor and the electric motor to reciprocate the traveling device.

10. The combination with a spring motor, and an electric winding motor associated therewith; of make-and-break mechanism for the electric motor circuit, comprising, a stationary contact and a pivoted contact in circuit with the motor, a spring tensionable in two directions to actuate the pivoted contact, a pair of detents pivoted to swing into and out of the path of the pivoted contact, a spring urging both detents into the path of the pivoted contact, and a traveling element movable in one direction by the spring-motor and in the other by the electric motor and associated with the detents to swing the same, one at a time, out of the path of the pivoted contact.

11. The combination with a spring-motor, and an electric winding motor associated therewith; of make-and-break mechanism for the electric motor circuit, comprising, a stationary contact and a pivoted contact in circuit with the motor, a spring tensionable in two directions to actuate the pivoted contact, a pair of detents pivoted to swing into and out of the path of the pivoted contact, an endless screw parallel to the said path and connected with the spring-motor for rotation thereby, a collar threaded on the screw, means connected with the electric motor to rotate the collar on the screw and permit axial movement of the collar, arms connected with the detents to actuate the same and extending into the path of the collar on

opposite sides of the latter, and a spring connected with the arms to urge the detents into the path of the pivoted contact.

5 12. In an electrically-driven winding apparatus for spring-motors, make-and-break mechanism for the circuit thereof, comprising, in combination, an insulating support, a stationary contact and a pivoted contact mounted on the support, a pair of
10 detents pivoted on the supports to swing into and out of the path of the pivoted contact, an endless screw parallel to the said path, a gear fixed to the screw to rotate the same, a shaft on which said screw
15 and gear are rotatably mounted, a collar threaded on the screw and having an aper-

ture in its side, a gear fixed to said shaft to rotate the same and having a finger extending through said aperture to rotate the collar and permit axial movement thereof on 20 the screw, arms connected with the detents to actuate the same and extending into the path of the collar on opposite sides of the latter, and a spring connected to said arms and urging the detents into the path of the 21 pivoted contact.

In testimony whereof I affix my signature in the presence of two subscribing witnesses.

WALTER P. PHILLIPS.

Witnesses:

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S. S. DUNHAM.