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W. M. FULTON.

AUTOMATIC CLOCK WINDING MECHANISM.

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NO MODEL.

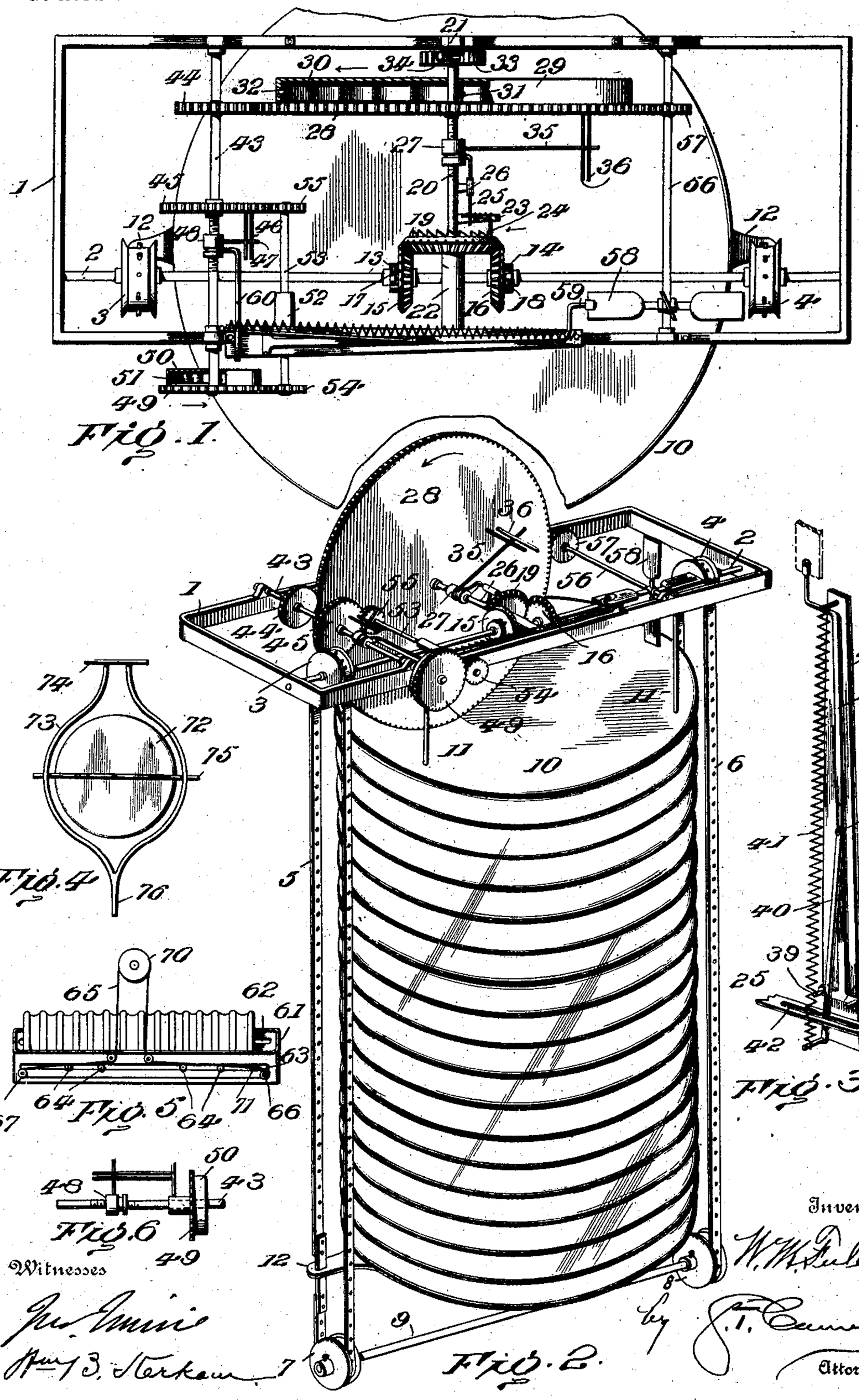

FIG. 1.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 2.

FIG. 3.

Witnesses

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AUTOMATIC CLOCK-WINDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 737,093, dated August 25, 1903.

Application filed November 25, 1901. Serial No. 83,625. (No model.)

To all whom it may concern:

Be it known that I, WESTON M. FULTON, a resident of Knoxville, Tennessee, have invented a new and useful Improvement in Automatic Clock-Winding Devices, which invention is fully set forth in the following specification.

My invention relates to clock-winding mechanism, and more particularly to automatic clock-winding mechanism deriving its motive power from variations in atmospheric pressure and temperature. It is essential that such a mechanism should perform its function without interfering with the clock's function as a timepiece.

In my United States Patent No. 685,269 and in my pending application, Serial No. 80,304, filed October 28, 1901, I have described certain forms of atmospheric motors capable of imparting rotary motion to a power-shaft; and the present invention has for its object to utilize such motors or other motors of the same general type for the purpose of winding clocks without in any way interrupting their function as timepieces.

With this object in view the invention consists in the combination of the power-shaft of an atmospheric motor with means for storing power and utilizing such stored power in running the clock.

Furthermore, the invention consists in the combination of the power-shaft of an atmospheric motor with means for storing power, the mechanism being provided with automatic devices for disconnecting the power-shaft when the limit of capacity of the power-storing means has been reached and for again connecting said means and power-shaft upon a predetermined decrease or consumption of the power thus stored.

The inventive idea involved is capable of receiving various mechanical expressions, and for the sake of illustrating the invention I have shown one of these in the accompanying drawings, which drawings, however, are not to be taken as defining the limits of the invention, reference being had to the claims for this purpose.

In the drawings, Figure 1 is a broken plan view, and Fig. 2 is an isometric perspective, of one form of the invention. Fig. 3 is a perspective view of a detail, and Fig. 4 is an end elevation showing a modified way of applying the power due to the motion of the collapsible vessel. Fig. 5 is a still further modification, and Fig. 6 is a modified form of a detail.

Referring to the drawings, 1 is a frame supported in any suitable manner and affording bearing for a shaft 2, having sprocket-wheels 3 and 4 keyed thereto, over which wheels sprocket chains or belts 5 and 6 pass, the lower ends of said belts passing over idler-pulleys 7 and 8 on a shaft 9. A collapsible vessel 10 is suspended to the frame 1 by means of rods 11 11, connected to the upper rigid wall of the vessel and to the frame, while the lower rigid wall of the vessel is connected to the sprocket-belts 5 and 6 by a bar or rod 12, so that motion is imparted to the belts in opposite directions as the vessel 10 contracts and expands, thereby intermittently revolving the shaft 2 in opposite directions.

Keyed on the shaft 2 are ratchet-wheels 13 and 14, and adjacent thereto are beveled gears 15 and 16, mounted to turn freely on the shaft 2, the two gears 15 and 16 bearing reversely-inclined pawls 17 and 18, engaging the respective ratchet-wheels 13 and 14, and said gears also meshing with beveled gear 19, mounted to turn on shaft 20, which has bearings in the frame at 21 and in a projecting arm 22 on the frame. Rigidly secured to the shaft 20 is an arm 23, having a lever 24 pivoted thereto which is capable of being vibrated into and out of engagement with ratchet-teeth on the rear face of the gear 19, and thereby locking or clutching the gear 19, to the shaft 20. To one end of said lever 24 a slide 25 is connected, said slide being mounted for movement parallel with the shaft 20 in a guide 26, secured to said shaft. This slide is connected to a collar embracing a nut 27, mounted to turn on a screw-threaded portion of shaft 20. Mounted to turn loosely on the shaft 20 is a gear-wheel 28, to one face of which is secured a drum 29, inclosing a spring 30, one end of which is secured to the shaft at 31 and the other end to the drum at 32. A ratchet-wheel 33, keyed on the shaft

20, is engaged by a pawl 34 on the frame 1 and prevents the shaft from revolving except from right to left, while an arm 35, secured to the nut 27, extends between two bars 36, projecting from the face of wheel 28, thereby preventing the nut 27 from turning except with the wheel 28.

The construction of slide 25 and its operation in connection with lever 24 will be best understood by reference to Fig. 3, where the lever is shown pivoted at 37 to the arm 23 and bearing at its lower end a cross-arm 38, at each end of which arm are projecting pins 39, between which a second lever 40 vibrates on the pivot 37. A spring 41 is connected to the lever 40 and the arm 23, as shown, the tension of the spring tending to hold the lever 40 against one or the other of the pins 39. The slide 25 has a slot 42 formed in the end thereof, and the free end of lever 40 projects through said slot. Extending across one end of the frame 1 and having bearings therein is a shaft 43, on which is keyed the gear-wheel 44, meshing with the wheel 28, while a gear-wheel 45 is loose on the shaft and has projecting rods 46, between which plays an arm 47, secured to a nut 48, engaging screw-threads on the shaft 43 to prevent said nut from turning on said shaft independent of gear 45. A gear-wheel 49 is mounted to turn loosely on the projecting end of shaft 43, and this gear 49 has a drum 50, inclosing a spring 51, with one end fastened to the drum and the other end to the shaft in the same manner as explained in connection with gear 28, the spring 51 and the gear-wheel 49 being the driving-spring and gear of a clock mechanism. Turning in a bearing 52 is a shaft 53, parallel with shaft 43, carrying gear-wheels 54 and 55, fast thereon and gearing, respectively, with gears 49 and 55.

Extending across the end of frame 1 opposite to shaft 43 is shaft 56, having bearings in the frame and carrying gear 57, keyed thereto, and a flutter-wheel 58, also fast thereon, the flutter-wheel being normally engaged by a stop 59 exactly similar to that shown in Fig. 3, which stop is operated by a slide 60, (corresponding to slide 25,) having a collar-engaging nut 48 on shaft 43.

The operation of the device is as follows: Assume the vessel 10 to contain some expansive agent or mixture, as air and ammonia-gas in the presence of water, which will absorb a portion of the gas, and thus cause the vessel to partially collapse, thereby elevating the points 12 12, where the vessel is connected to the belts 5 and 6, and causing the wheel 16 to engage and turn the gear 19 in a direction the reverse of the movements of the hands of a watch. If now the temperature should rise, the water in the vessel would give off a portion of the absorbed gas, the vessel would expand and cause gear-wheel 15 to turn gear 19 in the same direction as did gear 16, all in substantially the same manner as set forth in my patent above referred to. Since the gear 19 is clutched or locked to the shaft 20 by the catch-lever 24, the shaft 20 turns with said gear 19, thereby winding up the spring 30 within the drum 29. Gear-wheel 28 is locked against revolution by stop 59 through flutter-wheel 58 and gear 57, and the revolutions of shaft 20 therefore cause the nut 27 to gradually approach the wheel 19 and push the slide 25 till its slotted end 42 advances the lever 40 past its median line, whereupon the spring 41 acts to quickly throw lever 40 against the pin 39 opposite to that against which it rests in Fig. 3, thereby withdrawing lever 24 from engagement with wheel 19, and thus disconnecting said wheel from the shaft 20 and leaving it free to turn on said shaft. This disengagement of wheel 19 from shaft 20 is timed to occur at the instant when the spring is fully wound or wound to the desired tension. The action of the spring 51 is to drive the wheel 49, which may be geared in the usual way with the clock mechanism, and the wheel 45 is revolved around the shaft 43 by the intermediate gears 54 55, thereby operating the nut 48, which actuates the slide 60 and withdraws the stop 59 from the flutter-wheel 58 before the spring 51 is run down. This frees the large gear-wheel 28, and it is driven in the direction of the arrow, Fig. 2, and through the gear 44 and shaft 43 rewinds the spring 51, which is weaker than spring 30. The revolution of the shaft 43 while winding spring 51 advances nut 48 and slide 60 to again cause stop 59 to engage flutter-wheel 58, the stop 59 being secured to a flexible lever to avoid a too sudden stoppage of the parts. It will be noted that by reason of the construction shown in Fig. 3 the clutch-lever 24 and the stop 59 are suddenly thrown into and out of operation, thereby avoiding noise and wear upon the mechanism. From the foregoing it will be seen that the office of the spring 30 is merely to store energy generated by the motor, and the spring may be made large and strong, so that the supply of energy generated by the motor when atmospheric changes are great may be utilized for winding the clock during periods of stagnation in weather conditions.

In Fig. 8 of my Patent No. 685,269 I have shown means whereby a wheel P^3 and weight W^3 may replace the wheel 28 and spring 30 herein shown. In some cases the motor may be directly connected to the clock-winding shaft 43 without the intervention of an arrangement, as spring 30, for storing power.

In Fig. 5 I have shown an arrangement in which the collapsible vessel is confined within a frame 61, having long narrow slots 62 63 in its opposite sides, and guide-pins 64, secured to the vessel, travel in said slots. A sprocket chain or belt 65 is secured to the

vessel through a cross-bar 71, attached to the end of the vessel, and passes over idle pulleys 66, 67, 68, and 69 on the frame and thence to the sprocket-wheel or driving-pulley 70, which corresponds to either of the pulleys 3 or 4 of Figs. 1 and 2. It will be understood that there may be two of the belts or sprocket-chains 65 and two of the pulleys or sprocket-wheels 70, one on either side.

Fig. 4 illustrates another way of causing the collapsible vessel to operate the sprocket-chain. In this figure, 72 is the collapsible vessel, 73 is a rigid frame hinged at 74 to any suitable support, and the rod 75 being secured to the movable end of the collapsible vessel and pivotally connected to the frame 73. By connecting a single sprocket-chain to the lower end 76 of the frame the movements of the collapsible vessel can be made to produce increased movement of the sprocket-chain.

Instead of the wheel 45, shaft 53, and wheels 54 and 55 for operating the nut 48 I may use the construction shown in Fig. 6, in which the wheel 49 has a hub or boss extending along the shaft 43, and an arm 77 is secured thereto and supports rods 78, between which the rod 47 on the hub extends. The operation of this construction is identical with that shown in Figs. 1 and 2.

Having thus described the invention, I claim—

1. In an automatic clock-winding device, the combination of a motor actuated by variations in atmospheric conditions, a power-storing device, and a clock mechanism, with means automatically connecting and disconnecting said motor and power-storing device, and automatic connecting and disconnecting means between said clock mechanism and the power-storing device.

2. In an automatic clock-winding device, the combination of a motor operated by variations in atmospheric temperature and pressure, a power-storing device, automatic connecting and disconnecting means operated respectively by the power-storing device and the motor to connect and disconnect the two, a clock mechanism operatively connected to said power-storing device for winding said mechanism, and means automatically disconnecting said device and mechanism when the latter is wound.

3. In an automatic clock-winding device, the combination of a clock mechanism, a power-storing device and a motor, with automatic connecting and disconnecting means between said clock mechanism and storing device, and automatic connecting and disconnecting means between said storing device and said motor.

4. In an automatic clock-winding device, the combination of a clock mechanism, a power-storing device, and a motor, a screw-threaded shaft, a clutch between said shaft and motor, a nut on said threaded shaft and operatively connected to said clutch and actuating the same to connect and disconnect the shaft and motor, means restraining said nut from turning during the revolutions of the shaft, and means turning said nut around said shaft during the operation of the power-storing device.

5. In a clock-winding device, the combination of a motor, a power-storing device, and a clock mechanism, a shaft operatively connected to said power-storing device, a clutch between said shaft and motor, a spring operatively connected to said clutch and means reversing the direction in which said spring throws said clutch at predetermined times.

6. In a clock-winding device, the combination of a motor, a power-storing device and a clock mechanism, with a clutch between said motor and power-storing device, a spring-actuated detent normally restraining the storing device against winding the clock mechanism and means operated by the clock mechanism to reverse the action of the spring, whereby the detent is withdrawn from the power-storing device.

7. In a clock-winding device, the combination of a motor, a power-storing device, and a clock mechanism, with a clutch between said motor and power-storing device, a detent normally restraining the storing device against winding the clock mechanism, a spring actuating said detent, means reversing the direction of action of said spring, and connections between the power-storing device and spring, and between the clock mechanism and said spring, whereby the detent is withdrawn when the clock is nearly run down and is returned when the clock is wound.

8. In an automatic clock-winding device, the combination of a spring having a winding-shaft, a power-storing device, a motor actuated by variations in atmospheric conditions to move alternately in opposite directions, with means for actuating said device during the opposite movements of said motor, and means automatically connecting and disconnecting said motor and power-storing device, connections between said power-storing device and said winding-shaft, a stop normally holding said power-storing device inoperative, and automatic means periodically withdrawing and returning said stop.

9. In an automatic clock-winding device, the combination of a mainspring and its winding-shaft, a motor actuated by variations in atmospheric conditions to move alternately in opposite directions, an intermediate power-storing spring, with means for actuating said power-storing spring during the opposite movements of said motor, and means connecting said motor to said power-storing spring to wind the same, devices automatically disconnecting said motor and power-storing spring when the latter is wound to a

predetermined point, connections between said power-storing spring and the winding-shaft of the mainspring, a stop normally holding said power-storing spring inoperative and means automatically withdrawing said stop when the mainspring is unwound to a predetermined point.

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

WESTON M. FULTON.

Witnesses:
E. F. MYNUTT,
JNO. C. HAUK.