No. 778,237. PATENTED DEC. 27, 1904.

W. M. FULTON.

WINDING MECHANISM FOR CLOCKS.

APPLICATION FILED AUG. 3, 1903.

2 SHEETS—SHEET 1.

FIG. 1.

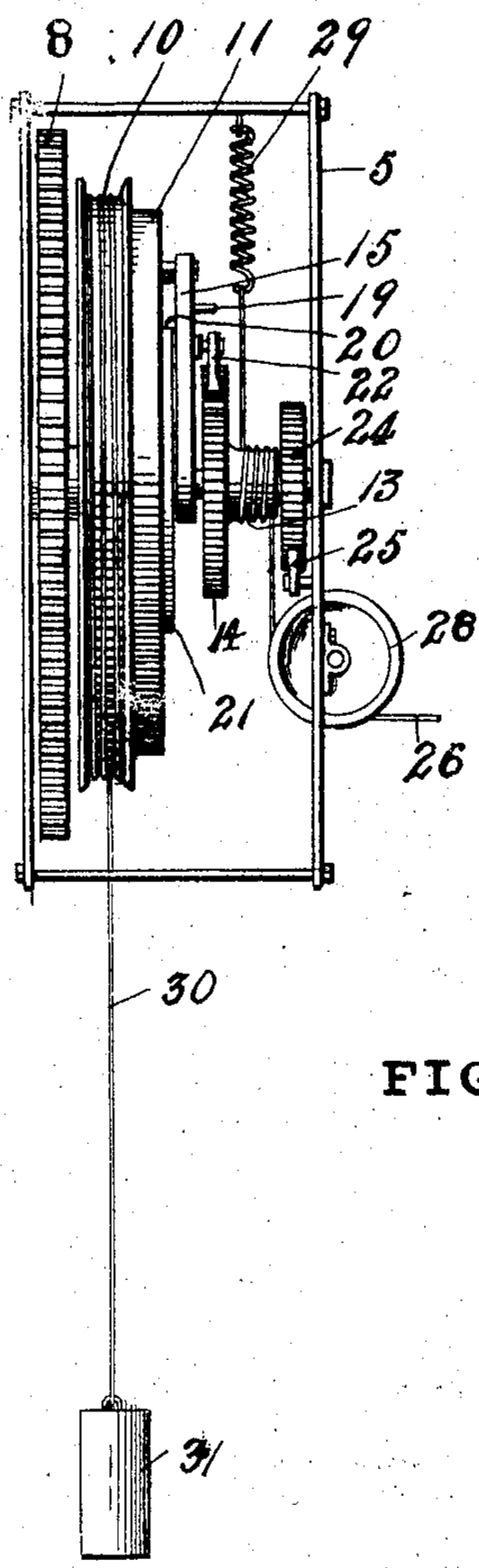
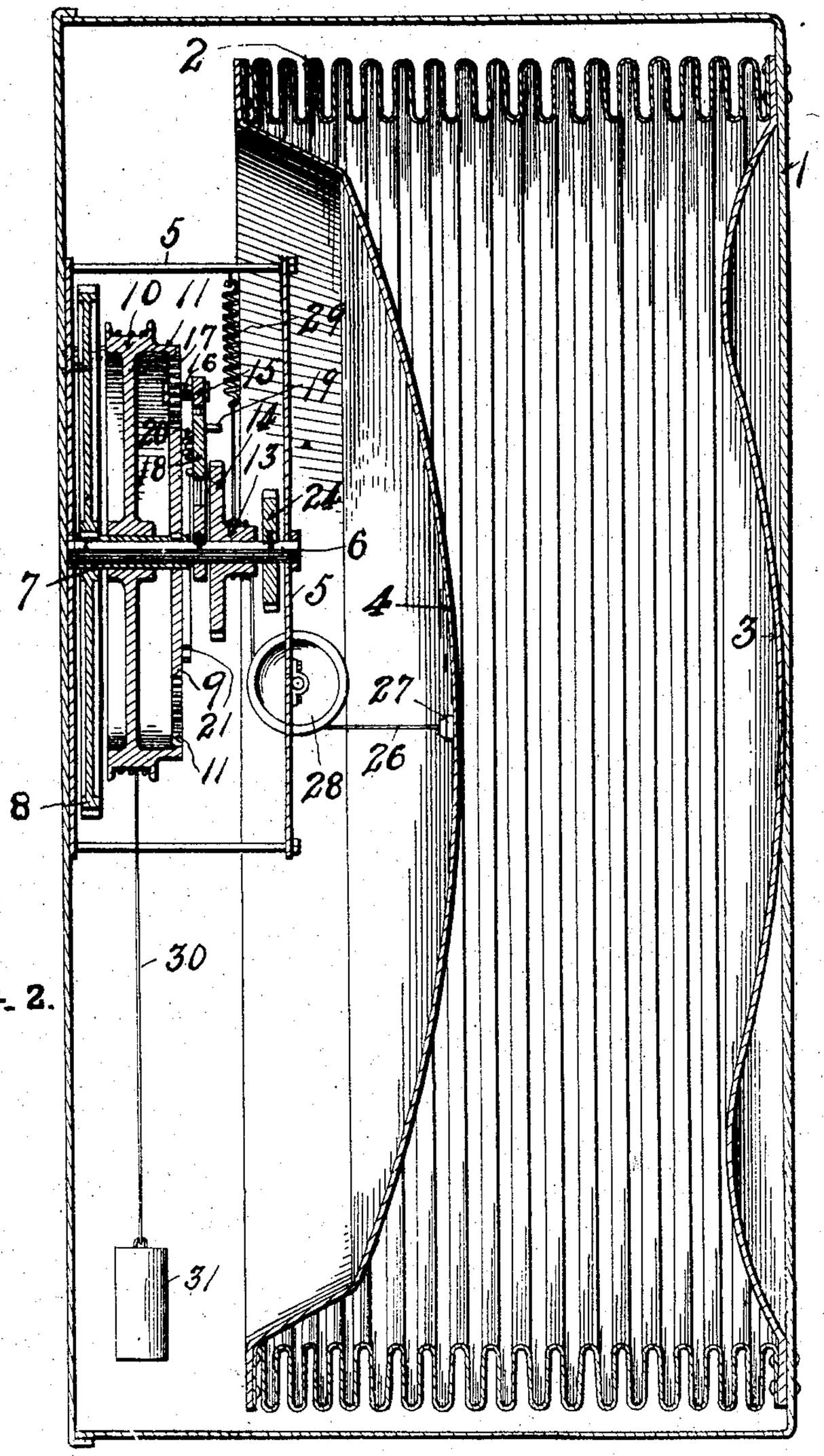


FIG. 2.



Witnesses
Chas. K. Davies.
Jno. B. Herkamer

Inventor
Wesley M. Fulton
by Munn Cannon Lewis
Attorneys

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2 SHEETS—SHEET 2.

FIG. 3.

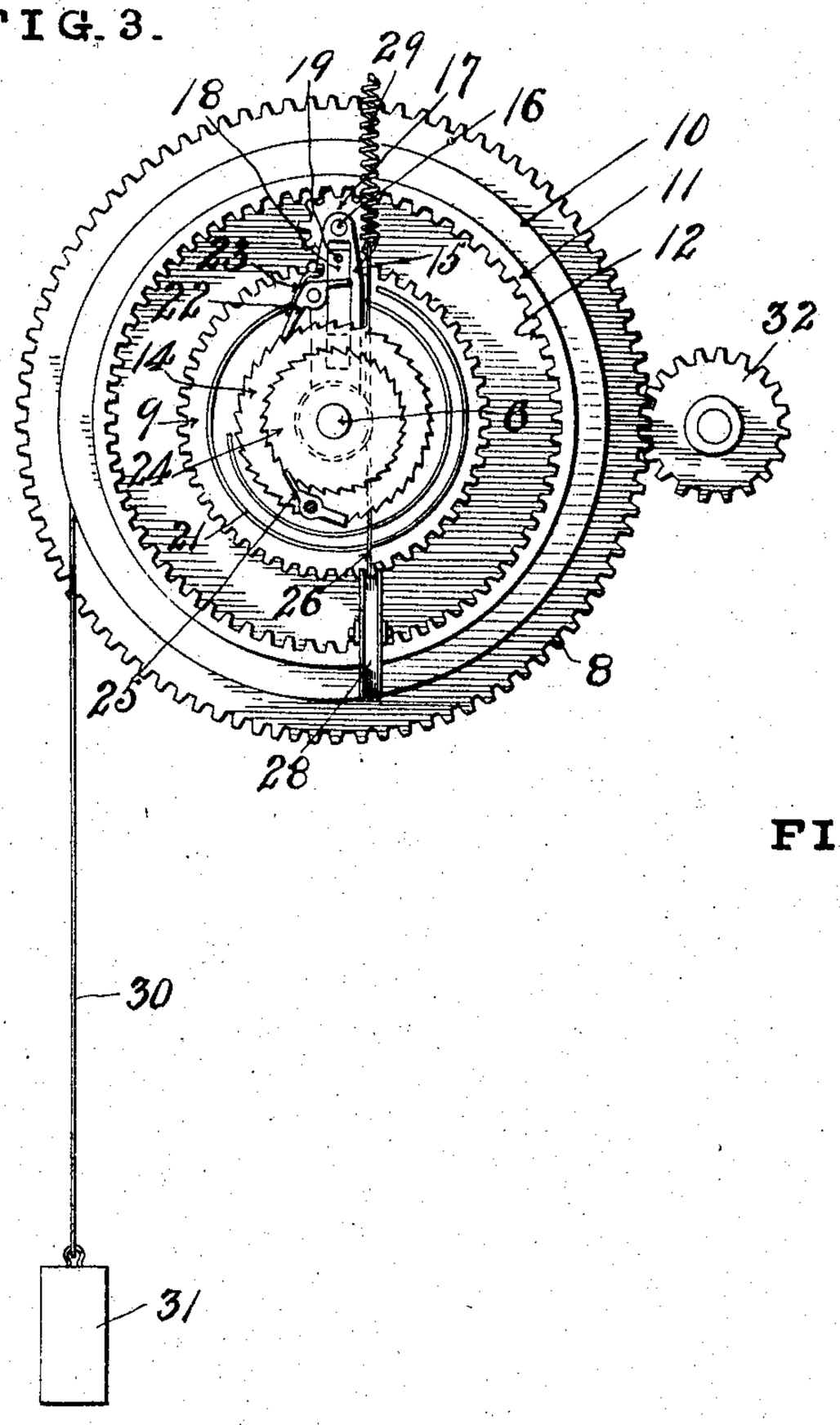


FIG. 4.

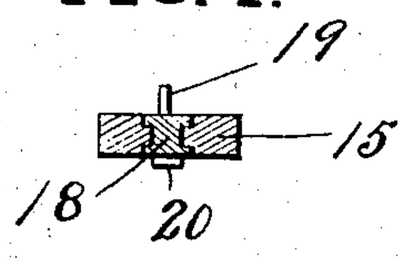
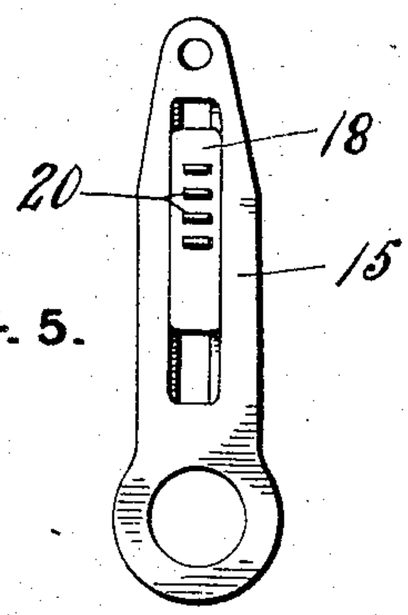


FIG. 5.



Witnesses
Chas. K. Davies.
Wm. B. Kerkam

Inventor
Weslain M. Fulton
By Munn Cannon Lamb
Attorneys

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UNITED STATES PATENT OFFICE.

WESTON M. FULTON, OF KNOXVILLE, TENNESSEE.

WINDING MECHANISM FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 778,237, dated December 27, 1904.

Application filed August 3, 1903. Serial No. 168,107.

To all whom it may concern:

Be it known that I, WESTON M. FULTON, of Knoxville, Tennessee, have invented a new and useful Improvement in Winding Mechanism for Clocks, which invention is fully set forth in the following specification.

This invention relates to automatic clock-winding mechanism, and more particularly to that class of devices wherein the power for winding the clock is due to changes in atmospheric conditions, which changes afford the source of power for actuating a motor.

Since atmospheric motors are actuated by the intermittent irregular changes in atmospheric conditions, the power developed therefrom is developed intermittently and irregularly; and the object of the present invention is to provide means whereby this irregular supply of power may be stored in a spring or weight, from which the clock may draw the necessary energy to propel it. It is essential that the apparatus be so constructed that the storing of energy by the motor and the absorbing of energy by the clock may be capable of occurring simultaneously, but independently, so that the one process shall not interfere with the other. The amount of space available for the location of the device in the clock-case being limited, it is of importance that the arrangements of the parts shall result in compactness of structure. It is also necessary that means be provided whereby the motor may automatically disconnect itself from the power-storage device when the latter has become fully charged and be reconnected thereto when a portion of the stored power has been exhausted. Heretofore various efforts have been made to devise mechanism for this purpose; but, so far as I am informed, they have been more or less unreliable and have required complicated mechanism. Moreover, they have been of such a character as to render it impossible to place them in the comparatively confined space of the clock-case.

The object of the present invention is to provide an automatic clock-winding mechanism whose source of power shall be due to variations in atmospheric conditions, which shall be simple in construction and compact in character, to the end that the same may be cheaply manufactured, readily inclosed within the clock-casing, accurate in its operations, and not liable to get out of order.

With this end in view the invention consists in an atmospheric motor operatively connected to means for storing power, which power-storing means are in continuous operative connection with the clock driving mechanism, while the motor is provided with means for automatically connecting and disconnecting it from the power-storing device, the whole being so arranged and constructed that the power may be simultaneously stored in the device by the motor and withdrawn therefrom for driving the clock mechanism and may also be free to drive the clock mechanism during the intervals of time when it is disconnected from the motor.

More specifically stated, the invention consists in an atmospheric motor, preferably located within the clock-case, combined with means for actuating a pinion operatively connected to the winding-drum of the power-storing device and an automatic device for disconnecting the motor from said pinion.

The invention may receive various mechanical expressions, one of which is embodied in the accompanying drawings, in which—

Figure 1 is a side elevation of the invention with the atmospheric motor removed therefrom. Fig. 2 is a vertical section through a clock-case, showing the motor and the power-storing device in position therein. Fig. 3 is a rear elevation of the power-storing device, and Figs. 4 and 5 are illustrations of details.

Referring to the drawings, 1 is a clock-case of any suitable construction, upon one wall of which, preferably the rear wall, is fixedly mounted an atmospheric motor 2. This motor may be of any desired construction and is here shown as consisting of a hermetically-sealed collapsible vessel containing a confined body of a suitable expansive agent sensitive to variations in atmospheric conditions. The motor has a rigid end wall 3 secured to one end wall of the clock-casing and the other rigid end wall 4 free to move as the vessel expands and contracts. Secured to the opposite face of the clock-casing is a rigid frame 5, within which the shaft 6 takes bearing and

is free to turn. Loosely mounted upon said shaft is a sleeve 7, and keyed to the opposite ends of said sleeve are spur-gears 8 and 9, while a drum 10 is loosely mounted upon the sleeve 7 between said spur-gears. This drum 10 has projecting from its face on the side adjoining the spur-gear 9 a flange 11, which has formed thereon an inner spur-gear 12, which somewhat exceeds in diameter the spur-gear 9, but which lies in the same vertical plane as said last-mentioned spur-gear. Loosely mounted upon the shaft 6 is a hub or small drum 13, upon one end of which is supported a ratchet-wheel 14, which may be either keyed thereto or, as here shown, integrally formed therewith. Keyed to the shaft 6 between the ratchet-wheel 14 and the spur-gear 9 is an arm 15, upon which there is a laterally-projecting pin 16, serving as the bearing for a pinion 17, which turns loosely thereon. This pinion 17 is of such diameter as to mesh with the spur-gear 9 and the inner spur-gear 12.

Mounted in a radially-extending slot on the arm 15 is a slide 18, having on its outer face a pin 19 and on its inner face a rack 20, which rack engages with a spiral rib 21, formed on the face of the spur-gear 9. A pawl 22 is mounted on the exterior face of the arm 15, the nose of which pawl is normally held by a suitable spring 23 in engagement with the teeth of the ratchet-wheel 14, while the tail of the pawl extends across the radial slot in the arm 15 in the path of movement of the pin 19 on the slide 18. A second ratchet-wheel 24 is keyed to the shaft 6, and a pawl 25 is mounted upon the frame 5 and held in engagement with the ratchet-wheel 24, so as to permit it to rotate in one direction only.

A suitable cable 26 is secured to the rigid end wall 4 of the motor, and preferably at the central point 27 thereof, and thence extends over a pulley 28, mounted on the frame 5, and thence with several turns around the drum 13, its opposite end being secured to a spring 29, secured to any suitable abutment, here shown as the frame 5.

A suitable weight-supporting cord 30 is passed with several turns around the drum 10 and supports a weight 31.

The spur-gear 8 meshes with a pinion 32 on the driving-shaft of a clock.

Bearing in mind that the spur-gears 8 and 9, arm 15, and the ratchet-wheel 24 are keyed to their respective bearings and that the sleeve 7, drum 10, and the hub 13, with its supported ratchet-wheel, are loosely mounted upon their respective bearings, the operations of the device are as follows:

Suppose the atmospheric conditions to so change as to collapse the motor somewhat. The wall 3 of the motor being fixed, the wall 4 will move toward the right, thereby drawing the cable 26 and turning the hub 13 and placing the spring 29 under increased tension. The revolutions of the hub 13 will be transmitted through the ratchet-wheel 14, arm 15, and pinion 17, which in turn will actuate the drum 10, so as to wind the cord 30 thereon and lift the weight 31. On the other hand, if atmospheric changes should cause the motor to expand the wall 4 will move to the left and the spring 29 will draw the cable 26 so as to revolve the hub 13 in the opposite direction, the pawl 25 engaging the ratchet-wheel 24 and preventing the reverse movement of the arm 15 and the drum 10.

Since the pinion 17 is free to turn on its bearing 16, the weight 31 will react through the pinion 17, spur-gear 9, sleeve 7, spur-gear 8, and pinion 32 on the driving-shaft of the clock.

The parts are so proportioned and arranged that when the requisite quantity of power has been stored the spiral 21 on the face of the spur-gear 9 will have lowered slide 18 to the point where the pin 19 will bear upon the tail of the pawl 22, and thereby disengage said pawl from the ratchet-wheel 14. When a portion of the stored power has been consumed by the clock, the spiral 21 will have raised the slide so as to withdraw the pin 19 from engagement with the pawl, which under the influence of the spring 23 will reëngage the ratchet-wheel 14.

It will be apparent from the construction that the absorption of power by the clock will take place continuously without interruption, due to the irregular lifting of the weight by the motor. It will also be apparent that the motor stores energy only when moving in one direction. Experience has shown this to be the simplest and most efficient method.

It will be understood by those skilled in the art that a spring instead of a weight may be used for storing the power and that various mechanical equivalents for the internal gear 12 and the pinion 17 may be employed without departing from the spirit of the invention.

Having thus described the invention, what is claimed is—

1. In a clock-winding device, the combination of an atmospheric motor, a power-storing device, a pinion gearing with said power-storing device and carried on an arm, a shaft actuated by said motor and to which the arm is rigidly connected, a clock driving-shaft and operative connections between said pinion and said shaft.

2. In a clock-winding device, the combination of a power-storing device, an atmospheric motor, a revolving arm driven by said motor, a pinion carried by said arm and meshing with a gear-wheel connected to said power-storing device, a clock driving-shaft, and a train of gearing between said pinion and shaft.

3. In a clock-winding device, the combination of a power-storing device having a gear-wheel connected thereto, a revolving arm bearing a pinion meshing with said gear-wheel, a

clock driving-shaft, gearing connecting said pinion and driving-shaft, an atmospheric motor, and automatic connecting and disconnecting means between said motor and arm.

4. In a clock-winding device, the combination of a power-storing device, and an atmospheric motor, with a ratchet-wheel operated by said motor, a revoluble arm bearing a pawl engaging said ratchet-wheel, a pinion carried by said arm and operatively connected to said power device, and means automatically disengaging said pawl and ratchet when the desired maximum of power is stored.

5. In a clock-winding device, the combination of a power-storing device and an atmospheric motor, with a clock driving-shaft, a revoluble arm bearing a pinion and a pawl, a ratchet-wheel driven by said motor and engaged by said pawl, a gear-wheel connected to said power device and meshing with said pinion, and another gear-wheel connected to said driving-shaft and also meshing with the said pinion.

6. In a clock-winding device, the combination of a shaft, a radial arm thereon, an atmospheric motor, connections between said motor and arm whereby the latter is driven in one direction, means restraining the arm from movement in the other direction, a power-storing device, a clock driving-shaft, and a pinion carried by said arm and operatively connected to said storing device and said driving-shaft.

7. In a clock-winding device, the combination of a shaft, an arm secured thereon and revoluble therewith, a sleeve loosely surrounding said shaft, a winding-drum loosely mounted on said sleeve, a spur-gear keyed to said sleeve, an internal gear on said drum, a pinion mounted on said arm and engaging said spur-gear and said internal gear, an atmospheric motor operatively connected to said arm to revolve the same, and a clock driving-shaft connected to said sleeve.

8. In a clock-winding device, the combination of a power-storing device and an atmospheric motor, a shaft for the power-storing device, a pinion loose on said shaft, an arm fast to the shaft and carrying a spur-gear operating said storing device and meshing with said pinion, a ratchet-wheel loose on said shaft and operated by said motor, a spiral rib on the face of the pinion, a radially-movable rack on said arm engaging said rib, and a pawl carried by said arm operated by said rack and engaging said ratchet-wheel, whereby the motor is automatically disengaged from the power-storing device.

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

WESTON M. FULTON.

Witnesses:
R. A. BROWN,
T. A. BURRIER.