No. 814,767. PATENTED MAR. 13, 1906.

F. M. CLARK.

CLOCK.

APPLICATION FILED JUNE 11, 1904.

2 SHEETS—SHEET 1.

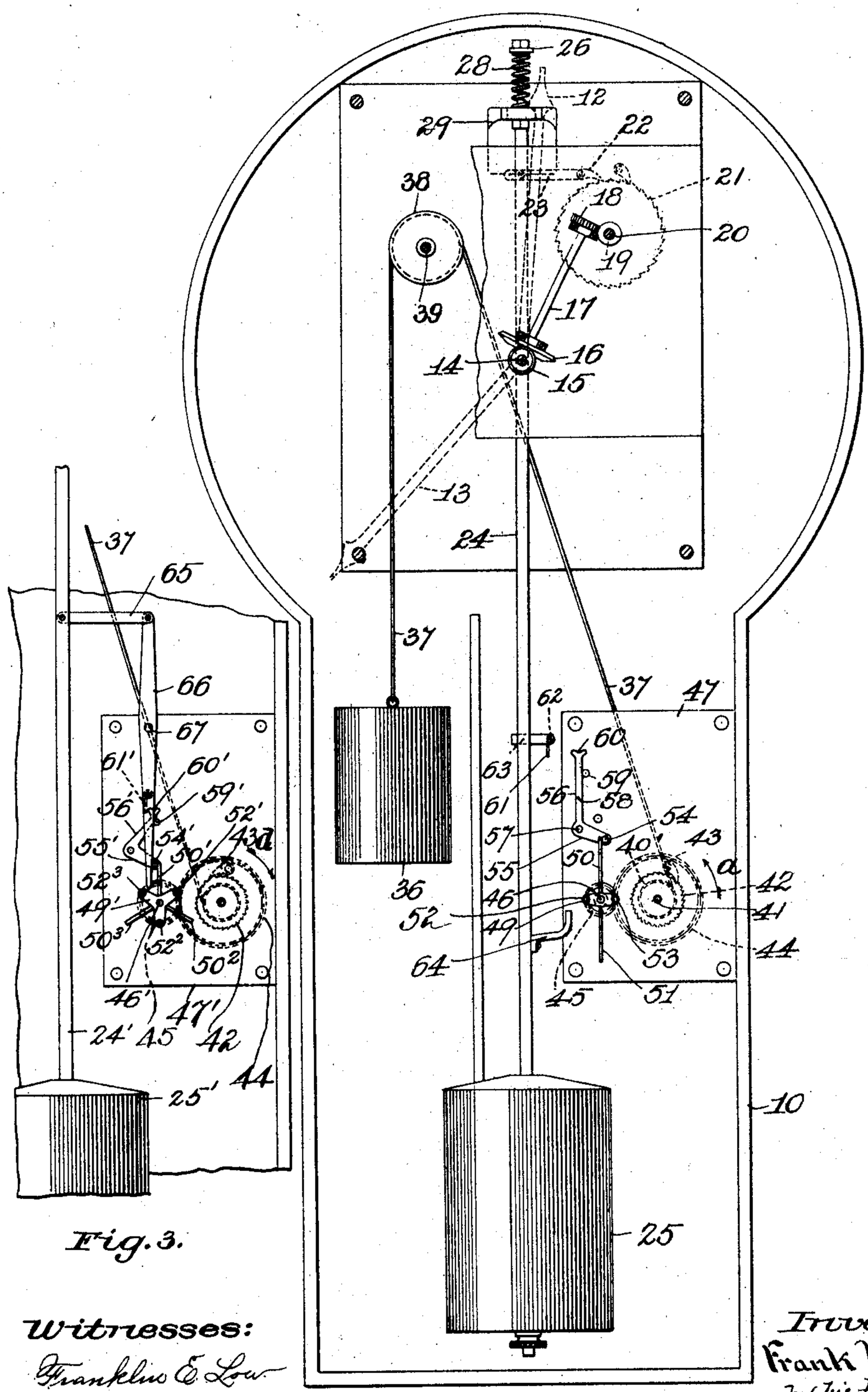

Fig. 3.

Fig. 1.

Witnesses:

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2 SHEETS—SHEET 2.

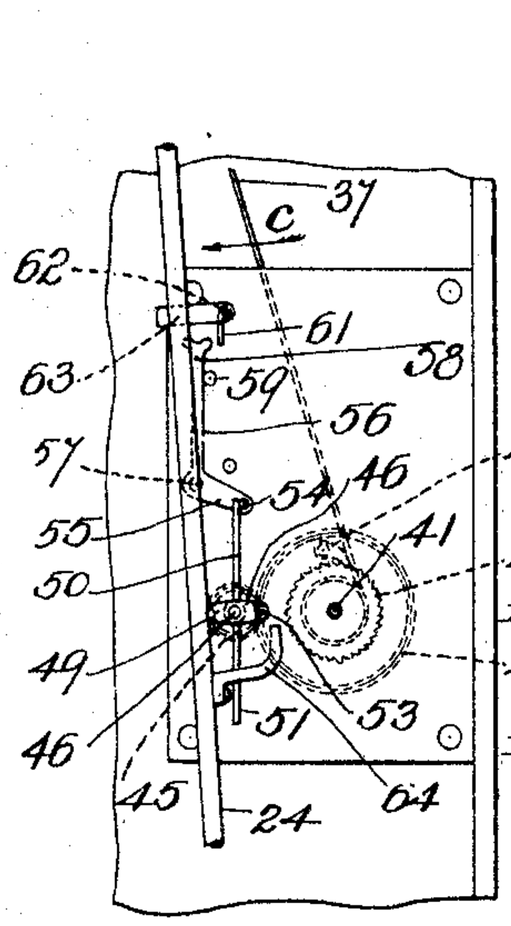

Fig. 5.

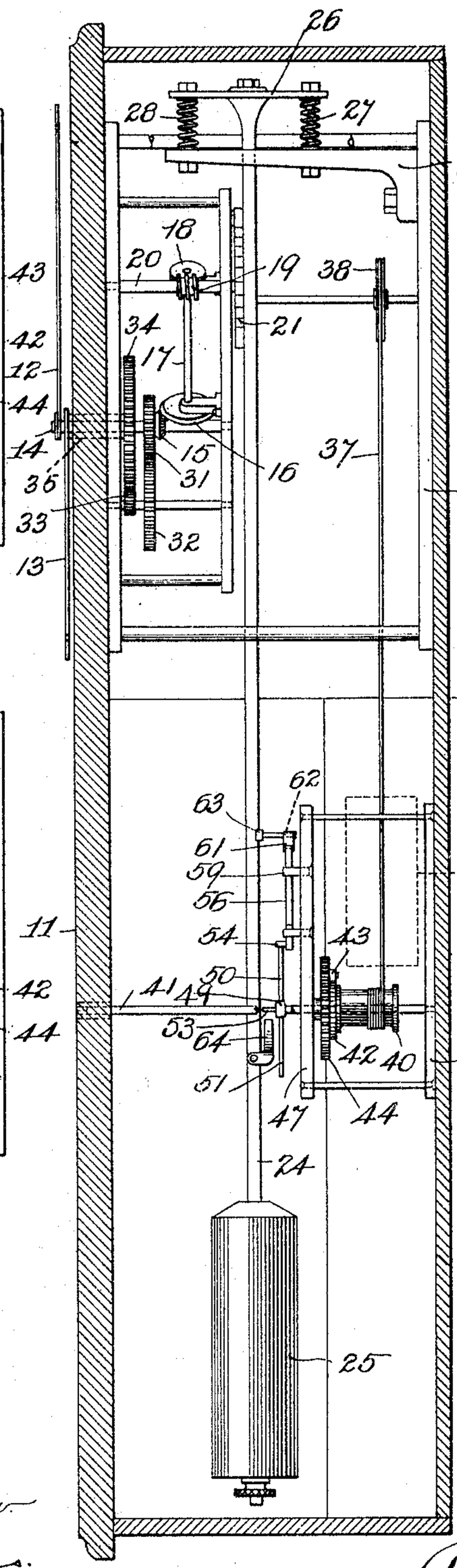

Fig. 2.

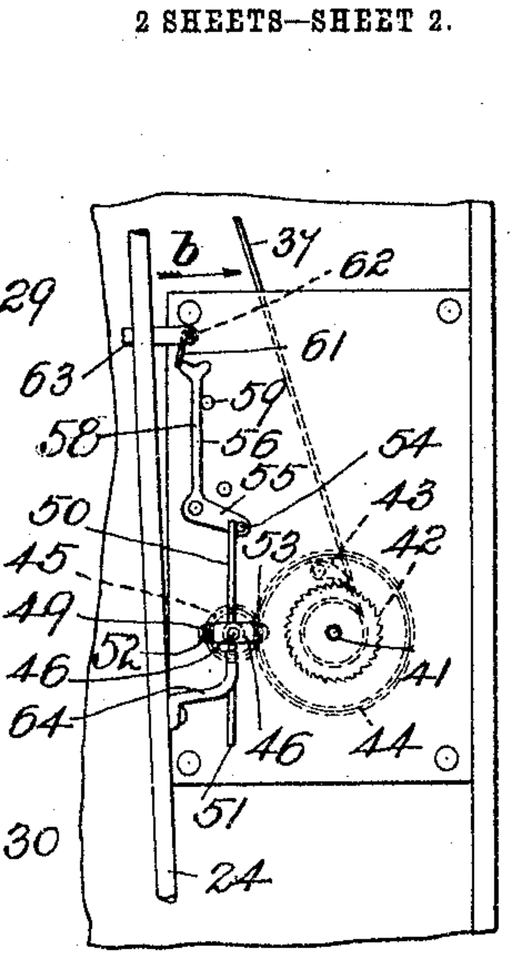

Fig. 4.

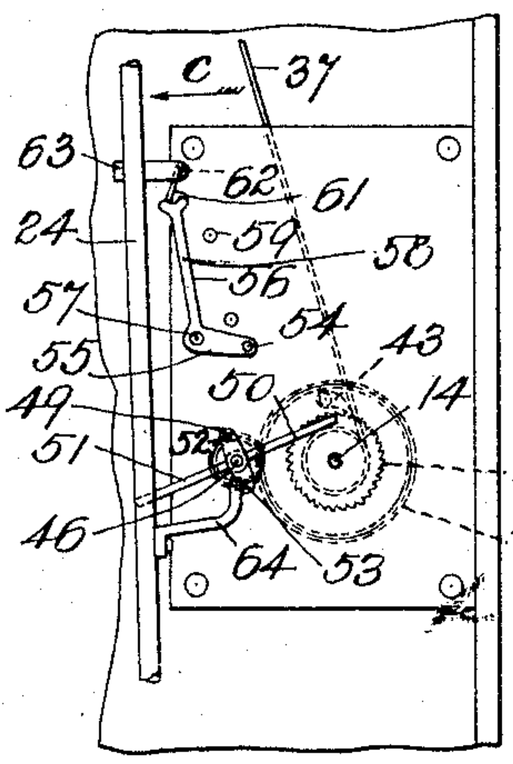

Fig. 6.

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UNITED STATES PATENT OFFICE.

FRANK M. CLARK, OF TILTON, NEW HAMPSHIRE, ASSIGNOR OF ONE-THIRD TO CHARLES H. PHILBRICK, OF TILTON, NEW HAMPSHIRE, AND ONE-THIRD TO FRANK G. BALCOM, OF MEDFORD, MASSACHUSETTS.

CLOCK.

No. 814,767. Specification of Letters Patent. Patented March 13, 1906.

Application filed June 11, 1904. Serial No. 212,061.

To all whom it may concern:

Be it known that I, FRANK M. CLARK, a citizen of the United States, residing at Tilton, in the county of Belknap and State of New Hampshire, have invented new and useful Improvements in Clocks, of which the following is a specification.

This invention relates to an improvement in clocks, the object of the invention being to provide a simple clock mechanism which will run for a long period of time without rewinding.

The invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings, Figure 1 is a front elevation of my improved clock, partly broken away and with the dial and front plate removed, the hands shown dotted. Fig. 2 is a side elevation of the same with the casing shown in section and part 41 broken away. Fig. 3 is a view similar to Fig. 1 of a modified form of my invention. Figs. 4, 5, and 6 are diagram views of a portion of the pendulum, together with the escapement mechanism in different positions with relation to each other.

In the drawings, Figs. 1, 2, 4, 5, and 6, 10 is the casing, and 11 the front plate of my improved clock. 12 is the minute-hand, and 13 the hour-hand, said minute-hand being fast to an arbor 14, which is rotated by a bevel-pinion 15, fast thereto and meshing into a bevel-gear 16, fast to the inclined arbor 17, said arbor 17 being rotated by a worm-gear 18, fast thereto and meshing into a worm 19. The worm 19 is fast to an arbor 20, and said arbor has an intermittent rotary motion imparted thereto by a ratchet 21, fast thereto and pawl 22, said pawl 22 being pivotally supported upon an arm 23, fast to the pendulum 24. The pendulum 24 has a weight 25 adjustably attached to the lower end thereof and a cross-bar 26 fast to the upper end thereof, said cross-bar being attached at its opposite ends to spiral springs 27 and 28, respectively, located beneath said cross-bar and resting upon a bracket 29, fast to a back plate 30, which in turn is fastened to the casing 10 of the clock. The hour-hand 13 is driven in the usual manner from the arbor 14 through gearing 31, 32, 33, and 34, the gear 34 being fastened to a sleeve 35, to which the hour-hand is also fastened. The power to impart a vibrating movement to the pendulum 24 is supplied by a weight 36, suspended from a cord 37, running over an idler-pulley 38, journaled upon an arbor 39, said cord 37 being connected to and wound around a drum 40, fast to an arbor 41, the front end of said arbor 41 being square in cross-section in order that the same may be rotated by means of a key in winding up the weight 36. A ratchet 42 is fastened to the drum 40 and is engaged by a pawl 43, pivoted to a gear 44, journaled to rotate upon the arbor 41 and meshing into a pinion 45, fast to an arbor 46, journaled to rotate in bearings in the front and back plates 47 and 48, respectively, said back plate 48 being rigidly fastened to the casing 10. The arbor 46 has a plate 49 fast to the front end thereof, and to said plate are fastened two vertical arms 50 and 51 and also two horizontal arms 52 and 53. As will be seen in the position of the parts illustrated in Figs. 1 and 2, the vertical arm 50 engages at its upper end a horizontal pin 54, projecting forwardly from the arm 55 of a bell-crank lever 56, pivoted upon a pin 57, fast to the plate 47. The vertical arm 58 of the bell-crank lever 56 rests normally against a pin 59, fast to the plate 47. The arm 58 has a recess 60 in the upper end thereof, into which at a certain time, as hereinafter described, the lower end of the tripper 61 enters and remains during a portion of the return movement of the pendulum 24. Said tripper is pivoted at 62 to an arm 63, fast to the pendulum 24.

The operation of the mechanism hereinbefore specifically described, and illustrated in Figs. 1, 2, 4, 5, and 6, is as follows: The weight 36 is wound up by means of a key applied to the arbor 41 and drum 40. The tendency of said weight is to cause the drum 40, arbor 41, ratchet 42, and gear 44 to rotate in the direction of the arrow *a*, Fig. 1, and thus through said gear 44 the pinion 45 will be caused to rotate in the opposite direction to the arrow *a* in said Fig. 1. The upper end of the arm 50, resting against the horizontal pin 54 on the detent-lever 56, normally prevents the rotation of the gears 44 and 45 and the descent of the weight 36. Assuming the pendulum to be vibrated and referring to Figs. 4, 5, and 6, it will be seen that as the pendulum moves in the direction

of the arrow *b*, Fig. 4, the tripper 61 will first engage the left-hand upper end of the arm 58 upon the detent-lever 56, and as said pendulum moves still farther toward the right in the direction of the arrow *b* the tripper 61 will be dragged across the top of the arm 58, rocking upon its pivot 62 as it passes over said vertical arm 58, and upon the return movement of the pendulum said tripper will first abut against the upper right-hand end of the arm 58, Fig. 5, the pendulum now being supposed to move in the direction of the arrow *c*, and said tripper will again be dragged across the top of the arm 58. As the pendulum vibrates the extent of its vibrations will gradually decrease until finally when at the extreme end of its vibration toward the right, as illustrated in Fig. 6, the lower end of the tripper 61 will fall into the recess 60 in the upper end of the arm 58 of the detent-lever 56 and will not be carried therebeyond to the position shown in Fig. 5, whereupon in the return movement of the pendulum in the direction of the arrow *c*, Fig. 6, the tripper 61 will remain for a portion of its movement with its lower end in the recess 60, and the bell-crank detent-lever 56 will be rocked upon its pivot 57, as illustrated in Fig. 6, until the pin 54 clears the upper end of the arm 50. Said arm, together with the arm 51 and the two horizontal arms 52 and 53 all being fastened to the arbor 46, will be rotated by said arbor as soon as the upper end of the arm 50 is released, as hereinbefore described, and the arm 53 will engage an arm 64, Fig. 6, fast to the pendulum 24, thus imparting to said pendulum increased momentum and pushing it toward the left. As said pendulum moves to its extreme position toward the left, the tripper 61 will become disengaged from the recess 60 and the detent-lever 56 will be returned to its normal position, with the vertical arm thereof resting against the pin 59, it being understood that the arm 55 of said detent-lever is weighted sufficiently to cause the same to return to the normal position indicated when freed by the tripper, passing sufficiently far toward the left with the pendulum 24, as hereinbefore described. The detent-lever returns to the position indicated in time so that the arm 51 in its rotation will be engaged by the pin 54, and thus stop further rotation of the gears 45 and 44 and drum 40, and also any further descent of the weight 36, until a repetition of the unlocking of the arbor 46 shall occur by reason of the pendulum decreasing in the extent of its vibrations sufficiently for the tripper to enter and remain in the recess 60 during a portion of the movement of said pendulum toward the left, as hereinbefore described.

It will be seen that in view of the fact that the pendulum 24 makes a great many vibrations before the extent of such vibrations is sufficiently reduced to allow the tripper 61 to fall into the recess 60 and disengage the detent-lever from the arms 50 or 51, as hereinbefore described, the weight 36 will only descend a slight amount at the end of a large number of vibrations of the pendulum and therefore that one winding of said weight will be sufficient to run the clock for a great length of time.

The suspending of the pendulum upon the two springs 27 28 forms a simple and practical means for use especially with heavy pendulums such as are used in tower-clocks and the like, doing away with any wear which is liable to occur where the pendulum is suspended from a pivot.

In Fig. 3 I have illustrated a modified form of my invention in which the pendulum 24′ is connected by a link 65 to an auxiliary pendulum or lever 66, pivoted at 67 to the plate 47′. The arbor 46′ is driven by a weight through a cord 37, drum 40, ratchet and pawl 42 and 43, respectively, and gears 44 and 45, as hereinbefore described in relation to the form illustrated in Figs. 1 and 2, except that the cord 37 is attached to the drum 40 in such a manner as to rotate said drum in the direction of the arrow *d*, Fig. 3, and in the opposite direction from that in which the drum is rotated in the form illustrated in Figs. 1 and 2. The arbor 46′ has in this instance, however, a three-armed plate 49′, to which are attached three radial arms 50′, 50^2, and 50^3 and also three horizontal arms 52′, 52^2, and 52^3. In Fig. 3 the arm 50′ is shown in contact with a horizontal pin 54′, fast to the arm 55′ of the bell-crank detent-lever 56′. The upper arm of said bell-crank lever rests against a pin 59′ and is held thereagainst by the weight of the arm 55′ of said bell-crank lever. A recess 60′ is provided in the top of the upper arm of said bell-crank lever and is adapted to receive, as hereinbefore described in relation to the form of this invention illustrated in Figs. 1 and 2, the lower end of a loosely-pivoted tripper 61′, said tripper being pivoted to the lever 66.

The operation of the device hereinbefore described, and illustrated in Fig. 3, is similar to that hereinbefore described, and illustrated in Figs. 1 and 2, except that the arbor 46′ rotates in the opposite direction from that in which the arbor 46 rotates and the radial and horizontal arms fast to the plate 49′ are three in number instead of two. The general principle and method of operation are, however, the same. The tripper 61′ drops into the recess 60′ at the end of a certain number of vibrations of the pendulum 24′, and upon the next return movement of said pendulum said tripper moves the detent-lever in the proper direction to release the arm 50′ and allow the arbor 46′ to rotate in the opposite direction to the arrow *d*, bringing the arm 52′ into contact with the lower end of the lever 66, imparting vibration thereto and through said

lever and the link 65 imparting an extra impulse to the vibrations of the pendulum 24′.

Having thus described my invention, what I claim, and desire by Letters Patent to secure, is—

1. A clock comprising in its construction a pendulum, a power-driven arbor, an arm fast to said arbor, a detent-lever adapted to engage said arm and prevent said arbor from rotating, and a tripper pivoted to said pendulum and adapted to contact with said detent-lever at each swing of said pendulum, said detent-lever provided with a recess into which said tripper enters and thereby locks said detent-lever to said pendulum during a portion of one of a series of movements of said pendulum and thereby releases said arm.

2. A clock comprising in its construction a pendulum, a power-driven arbor, an arm fast to said arbor, a detent-lever adapted to engage said arm and prevent said arbor from rotating, a tripper pivoted to said pendulum and adapted to contact with said detent-lever at each swing of said pendulum, said detent-lever provided with a recess into which said tripper enters and thereby locks said detent-lever to said pendulum during a portion of one of a series of movements of said pendulum and thereby releases said arm, and a projection fast to said arbor constructed to engage and vibrate said pendulum when said arm is released.

3. A clock comprising in its construction a pendulum, a power-driven arbor, means to lock said arbor against rotation, a tripper pivoted to said pendulum and adapted to contact with said locking means at each swing of said pendulum, said locking means provided with a recess into which said tripper enters and thereby locks said means to said pendulum during a portion of one of a series of movements of said pendulum and thereby unlocks said means from said arbor.

4. A clock comprising in its construction a pendulum, a power-driven arbor, means to lock said arbor against rotation, a tripper, and a vibrating support to which said tripper is pivoted, said support connected to and moved by said pendulum, said tripper adapted to contact with said locking means at each swing of said pendulum, said locking means provided with a recess into which said tripper enters and thereby locks said means to said pendulum during a portion of one of a series of movements of said pendulum and thereby unlocks said means from said arbor.

5. A clock comprising in its construction a pendulum, a power-driven arbor, an arm fast to said arbor, a lever adapted to engage said arm and prevent said arbor from rotating, and a loosely-depending tripper pivoted to said pendulum and adapted to contact with said lever at each swing of said pendulum, said lever provided with a recess into which said tripper enters and thereby locks said lever to said pendulum during a portion of one of a series of movements of said pendulum and thereby releases said arm, said tripper adapted to subsequently release said lever and allow it to again engage said arm.

6. A clock comprising in its construction a pendulum, a tripper, a vibrating support to which said tripper is pivoted, said support connected to and moved by said pendulum, and a detent-lever with which said tripper contacts at each swing of said pendulum, said detent-lever provided with a recess into which said tripper enters and thereby locks said detent-lever to said pendulum during a portion of one of a series of movements of said pendulum.

7. A clock comprising in its construction a pendulum, a tripper, a vibrating support to which said tripper is pivoted, said support connected to and moved by said pendulum, a detent-lever with which said tripper contacts at each swing of said pendulum, said detent-lever provided with a recess into which said tripper enters and thereby locks said detent-lever to said pendulum during a portion of one of a series of movements of said pendulum, a rotary arbor, and an arm upon said arbor adapted to engage said detent-lever.

8. A clock comprising in its construction a pendulum, a tripper, a vibrating support to which said tripper is pivoted, said support connected to and moved by said pendulum, a detent-lever with which said tripper contacts at each swing of said pendulum, said detent-lever provided with a recess into which said tripper enters and thereby locks said detent-lever to said pendulum during a portion of one of a series of movements of said pendulum, a rotary arbor, an arm upon said arbor adapted to engage said detent-lever, and a projection fast to said arbor adapted to engage and vibrate said pendulum.

9. A clock comprising in its construction a pendulum, a tripper, a vibrating support to which said tripper is pivoted, said support connected to and moved by said pendulum, a detent-lever with which said tripper contacts at each swing of said pendulum, said detent-lever provided with a recess into which said tripper enters and thereby locks said detent-lever to said pendulum during a portion of one of a series of movements of said pendulum, a rotary arbor, an arm upon said arbor adapted to engage said detent-lever, a projection fast to said arbor adapted to engage and vibrate said pendulum, a train of gears connected to said arbor, and a weight connected to and adapted to rotate said gears.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK M. CLARK.

Witnesses:

CHARLES S. GOODING,

ANNIE J. DAILEY.