No. 741,358. PATENTED OCT. 13, 1903.

F. W. MOORE.

ELECTRIC CLOCK.

APPLICATION FILED MAY 24, 1897.

NO MODEL.

Fig. 1.

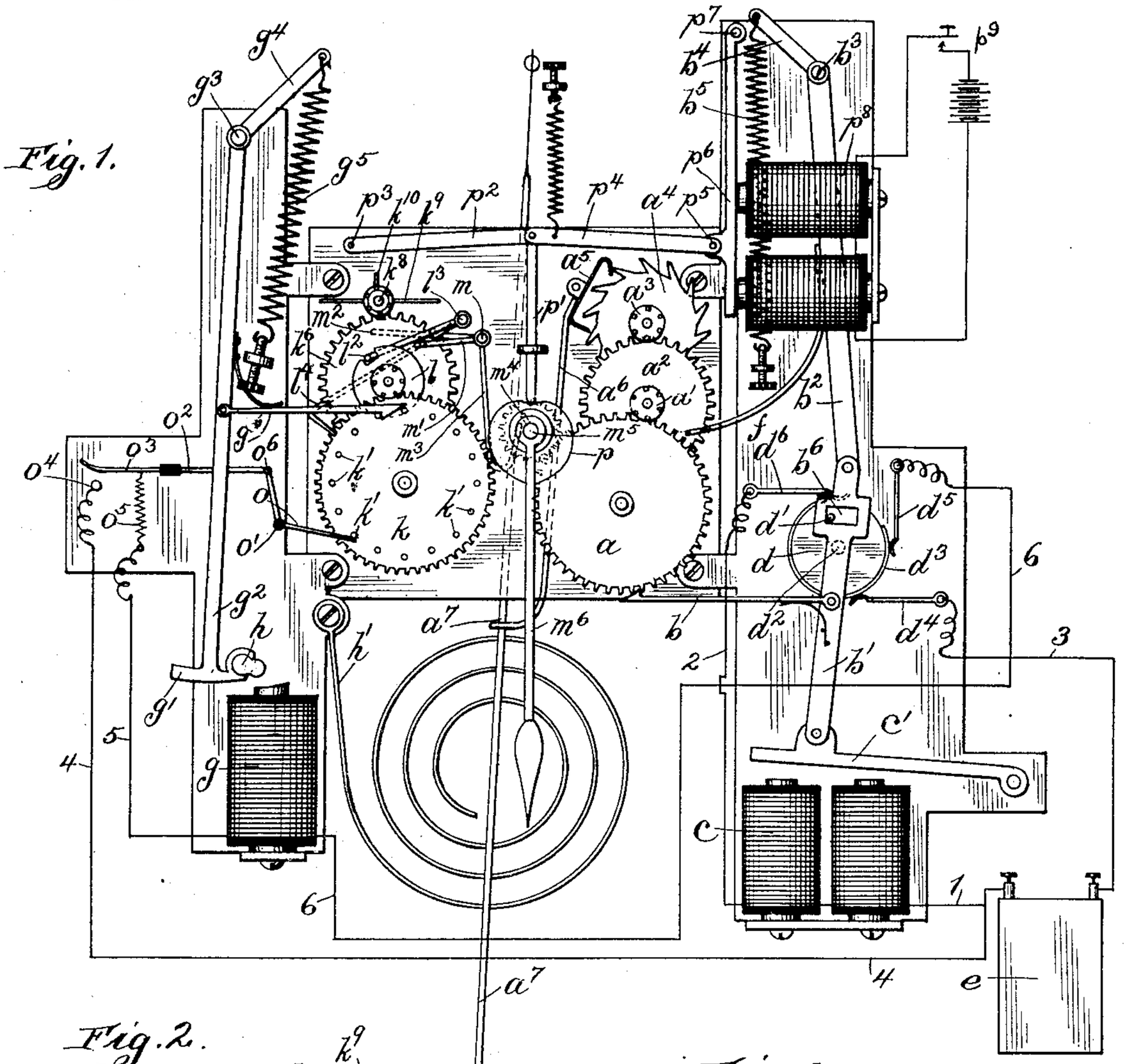


Fig. 2.

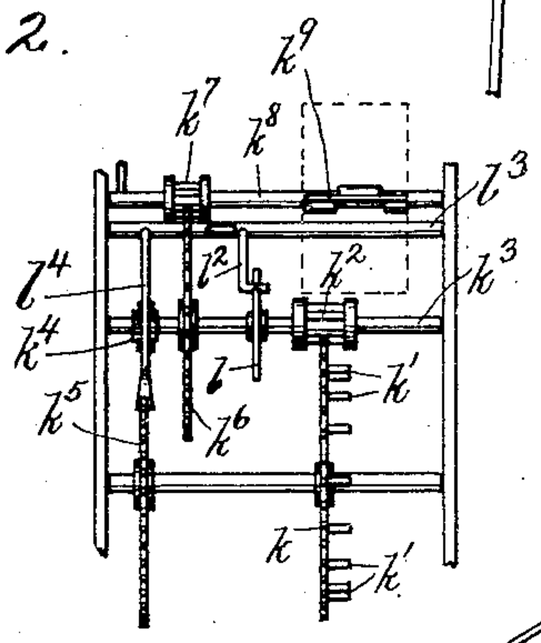
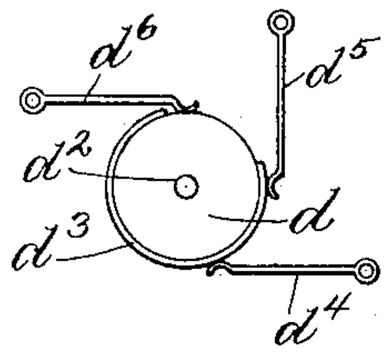


Fig. 4.



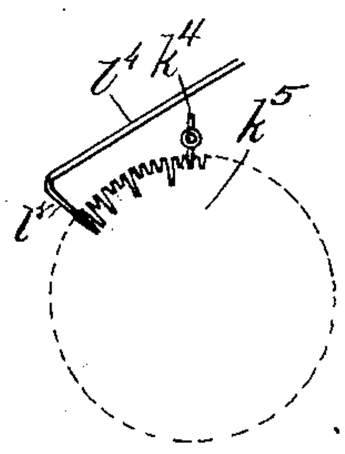


Fig. 3

Witnesses:
R. J. Jacker.
M. R. Rochford.

Inventor:
Frank W. Moore
By Fiddington & Jones.
Attorneys.

No. 741,358. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

FRANK W. MOORE, OF MAYWOOD, ILLINOIS.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 741,358, dated October 13, 1903.

Application filed May 24, 1897. Serial No. 637,896. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. MOORE, a citizen of the United States, residing at Maywood, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electric Clocks, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an electric clock provided with striking and synchronizing mechanisms, my object being to provide a clock which may be accurately operated by electromagnetic means.

I have described my invention in connection with the accompanying drawings, in which—

Figure 1 is a view illustrating the clock of my invention, the circuits being shown in diagram. Figs. 2 and 3 are details of the striking mechanism. Fig. 4 is a detail view of one of the circuit-controlling switches.

Like characters refer to like parts in the several figures.

Considering first the driving mechanism of the clock, which is illustrated upon the right of Fig. 1, the gear-wheel a engages the pinion a', carried upon a shaft with the gear-wheel a^2, which engages the pinion a^3, carried upon the same shaft with the verge-wheel a^4, with which engage the arms of the pallet or verge a^5, adapted to be oscillated by means of the arm a^6, which is connected with the pendulum a^7.

The teeth of the driving-wheel a are engaged by a detent-lever b, pivoted upon link b', the lower end of which link is pivoted to the pivoted armature c', adapted to vibrate in front of the electromagnet c. The opposite end of the link b' is pivoted to the bell-crank lever b^2, pivoted at b^3 and carrying an arm b^4, to which is attached a coiled spring b^5. The spring imparts to the pivoted lever b^2 and link b' a tendency to move to the right. The arm b^4 of the bell-crank lever extends at an angle to the axis of the spring b^5, so that as the spring shortens its length and decreases in tension the lever-arm through which it acts is lengthened, so that the effect of the spring in imparting to the bell-crank a tendency to rotate about its pivot is uniform throughout the travel of the lever. The link b' is provided with a transverse slot b^6, through which passes a pin d', carried upon the disk d, pivoted at d^2 to the link b'. The disk d carries upon the periphery a contact-wire or strip d^3, with which the brush d^4 makes continuous contact. A pair of brushes d^5 d^6 are provided, resting upon the periphery of the disk and adapted to alternately make contact with the contact-strip d^3 as the disk is rocked back and forth.

When the electromagnet c is energized, armature c' is attracted, thus moving the link b' and bell-crank b^2 laterally to bring the same into alinement. The link b' is thus moved laterally and carries the detent b to the left, the detent thus moving over the tops of the teeth of the wheel a. When the magnet is deënergized, the spring b^5, acting upon the lever b^2, makes link b' move laterally toward the right, thus moving the detent in a direction to rotate the gear-wheel a contraclockwise. The gear-wheel a being geared to the verge-wheel a^4, which is controlled in its movement by the pendulum, the spring b^5 acts to positively and slowly drive the train. As shown in Fig. 1, the brush d^6 rests upon the insulating periphery of the disk d and is out of contact with the contact-spring d^3. The spring is moving the lever and link to the right to rotate the disk d, and when the lever has been rotated sufficiently far to move the contact-strip d^3 into engagement with brush d^6, due to the engagement of the transverse slot with the pin d', circuit will be closed from battery e through conductor 1, electromagnet c, conductor 2, brush d^6, strip d^3, brush d^4, conductor 3, back to the battery. The armature of the electromagnet will be attracted and link b' will be moved toward the left to carry the end of the detent b to the left over the teeth of the gear-wheel a to make a new engagement therewith. During this return of the detent b to the left to make a fresh engagement the driving-train would remain at rest and the clock thus lose slightly were not means provided to prevent this loss of time.

Upon the bell-crank lever b^2 is carried a spring-arm or detent f, the end of which is adapted to engage the teeth of the gear-wheel a to rotate the same upon the movement of the bell-crank lever and the link to the left, during which time the detent b is not im-

parting rotation to the train. The wheel is thus always being positively driven either by the detent b or the detent f.

As the link b' moves to the left the pin d' upon the switch-disk is engaged to lock the disk in a contraclockwise direction to move the brush d^6 out of engagement with the contact-strip d^3 and to move brush d^5 into contact therewith. The brush d^5 controls the circuit through the electromagnet which operates the striking mechanism which I will now describe.

Armature g' of the electromagnet g is carried upon the end of the lever g^2, pivoted at g^3 and carrying an angularly-extending arm g^4, to which is attached the coiled spring g^5, which tends to move the armature g' to the left. Upon the armature is carried the striking-hammer h, of leather or other suitable material, the hammer being adapted to strike the coiled-wire gong h' to sound the hour. Upon the lever g^2 is pivoted the detent-lever g^6, the hooked end of which is adapted to engage the series of pins or teeth k' k', carried upon the disk k. The disk k is shown more clearly in Fig. 2, carrying upon the periphery teeth which mesh with a pinion k^2, carried upon the shaft k^3. Upon the opposite end of the shaft k^3 is carried a pinion k^4, having two teeth upon opposite sides which engage the teeth of the gear-wheel k^5, the gear-wheel k^5 being thus moved through the distance of two teeth upon each revolution of the shaft k^3. Upon the shaft k^3 is carried a cam l, which controls the striking of the clock. A rod or arm l^2 is mounted upon the shaft l^3 and has a bent end which normally rests in one of the two notches in the periphery of the cam l. Upon said shaft l^3 is also carried the arm l^4, the end of which is adapted to engage the teeth of the gear-wheel k^5.

Mounted upon a shaft m is an arm m', the end of which rests beneath the arm l^2. The shaft m also carries an arm m^2, the end of which extends to a point beneath the controlling-fan and also carries an arm m^3, having an upturned end adapted to be engaged and moved to the left by means of a pin m^4, carried upon the shaft m^5, upon which is mounted the minute-hand m^6. Resting against pins k' upon the disk or wheel k is a lever o, pivoted at o' and having an arm o^2, carrying pin o^6 and carrying upon the end an insulated contact o^3, adapted to engage a contact-anvil o^4. A spring o^5 is provided to pull the contact o^3 toward the anvil o^4. The anvil o^4 is connected with the side of the battery e, and contact o^3 is connected by conductor 5 to the electromagnet g, thence by conductor 6 with the brush d^5.

The operation of the striking mechanism is as follows: When the electromagnet c of the driving side is energized, thus moving link b' to the left, the switch-disk is rotated to move contact-strip d^3 into engagement with brush d^5. Circuit is thus made from battery e through conductor 3 to brush d^4, contact-strip d^3, brush d^5, conductor 6, electromagnet g, conductor 5, contact o^3, the opposite side of the battery extending from conductor 4 to anvil o^4, which is separated from o^3, circuit being thus open. The lever g^2 is illustrated in Fig. 1 as being at a short distance from the end of its leftward travel, so that when released the spring g^5 will tend to rotate the disk k, due to the engagement of the detent g^6 therewith. As the minute-hand rotates the pin m^4, carried upon the shaft m^5, engages the upturned end of the rod m^3 just before the striking is to take place, thus rocking shaft m and lever-arm m', which raises the arm l^2 and carries the end thereof out of the notch in the cam l, thus releasing the striking-train and permitting the spring g^5 to move the lever g^2 and carry the detent g^6 to the left, thus rotating the gear-wheel k and with it the striking-train. As soon as the arm k^{10}, carried upon the shaft k^8, engages the arm m^2 the fan is checked and remains stationary until the pin m^4 on the shaft m^5, carrying the minute-hand, has been moved out of engagement with the arm m^3, when the arm m^3 drops back to its former position, thus carrying the arm m^2 downward to release the arm k^{10} and permit the train to rotate. As the gear-wheel k rotates, the pin k', against which the arm o is resting, is moved from under the same, thus permitting the spring o^5 to move the contact o^3 into engagement with the anvil o^4, thereby completing the circuit of the battery e through magnet g to energize the same. Magnet g attracts armature g', and thereby forces hammer h against the sounding coil or gong h', at the same time carrying the detent g^6 to the right over the pins k' to make a fresh engagement. The lever g^2 in swinging to the right when attracted engages pin o^6 on lever o and rotates lever o on its pivot to move contact o^3 out of engagement with anvil o^4, thus deënergizing the magnet and permitting the spring to retract the armature-lever to move the detent to the left and rotate the gear-wheel k. When the lever g^2 has moved far enough to the left to leave the pin o^6, the arm o will be supported by the next pin k' on wheel k, and when arm o passes off of the same circuit is again closed and the operation is repeated as often as proper to sound the proper hour, as determined by the teeth of the wheel k^5, with which the arm l^4 engages. The wheel k^5 and arm l^4 are of the usual construction employed in striking-clocks. The train is permitted to rotate until the end of arm l^5 passes into one of the deep recesses in the periphery of the wheel, in which position the arm serves to check the rotation of the train.

I will now describe the synchronizing mechanism whereby the clock may be synchronized from a distance, when desired. Upon the main shaft m^5 is carried a heart-shaped cam p, the periphery of which is engaged by a pointed rod p', which is journaled to the end of a link p^2, pivoted at p^3, and to the end of a link p^4, pivoted at p^5, to the armature-lever p^6, pivoted at p^7. An electromagnet p^8 is

provided, from which circuit extends to a key p^9 at a distant point of control, whereby the magnet may be energized to cause the attraction of the armature to thus impart lateral movement to the links p^2 p^4 and force the rod p' downward against the eccentric periphery of the cam p, thus rotating the cam until the notch of the cam is brought opposite the rod p', in which position of the cam the hand is in the proper position. This construction of a longitudinally-movable rod and link connected with each other and with the armature-lever in the manner described constitutes a desirable construction wherein a maximum longitudinal movement of the rod p' is secured with a short pull of the electromagnet.

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

1. In a clock mechanism, a striking-train and a driving-wheel therefor, an electromagnet, an armature-lever therefor, a hammer carried on said lever for sounding the gong, and a detent engaging said driving-wheel and operated by said armature-lever, substantially as described.

2. In a clock mechanism, a striking-train, an armature-lever pivoted at one end and carrying the armature and the hammer at the opposite end, an electromagnet for rocking said lever, and means for driving said train by the movement of said lever, substantially as described.

3. In combination, an electromagnet and its armature, a lever pivoted at one end and extending in the direction of the movement of said armature, a link connecting the free end of said lever and the armature, clock mechanism, a detent engaging and imparting movement to the clock mechanism and receiving motion from the lateral movement of the pivoted lever and link, and means for producing motion in opposition to the magnet, substantially as described.

4. In combination, an electromagnet and its armature, a lever pivoted at one end and extending in the direction of the movement of said armature, a link connecting the free end of said lever and armature, a train of clock mechanism, a driving gear-wheel or ratchet, a detent engaging the teeth thereon to impart motion thereto and receiveing motion from the lateral movement of the pivoted lever and link, and means for producing motion in opposition to the magnet, substantially as described.

5. In combination, an electromagnet and its armature, a lever pivoted at one end and extending in the direction of the movement of said armature, a link connecting the free end of said lever and armature, a train of clock mechanism, a driving gear-wheel or ratchet, a pair of detents receiving motion from the lateral movement of said pivoted lever and link and respectively engaging the teeth of the gear-wheel or ratchet upon opposite sides of the periphery thereof to positively drive the train upon both the forward and backward movement of the lever and link, and means for producing motion in opposition to the magnet, substantially as described.

6. In combination, an electromagnet and its armature, a lever pivoted at one end and extending in the direction of movement of said armature, a link connecting the free end of said lever and the armature, a train of clock mechanism, a synchronizing-cam, and a rod or detent engaging the same and receiving motion from the lateral movement of the lever and link, and means for producing motion in opposition to the magnet, substantially as described.

7. In combination, an electromagnet and its armature, a pivoted lever extending in the direction of the movement of said armature, a link connecting the end of said lever and the armature, said lever having a short arm, a coiled spring connected therewith and extending angularly thereto and opposing said magnet, a clock mechanism and a detent for imparting motion thereto and receiving motion from the lateral movement of said lever and link, substantially as described.

8. In combination, an electromagnet and a pivoted armature-lever, a pivoted lever extending at right angles thereto, a link joining said pivoted lever and said armature-lever, a clock mechanism, and a detent receiving motion from the lateral movement of said pivoted lever and link and arranged to drive said clock mechanism, and means for producing motion in opposition to the magnet, substantially as described.

9. In combination, an electromagnet and its armature, a lever pivoted at one end and extending in the direction of the movement of said armature, a link connecting the free end of said lever and the armature, a train of clock mechanism, a driving gear-wheel or ratchet, a detent engaging the teeth thereon to impart motion thereto and receiving motion from the lateral movement of the pivoted lever and link, means for producing motion in opposition to the magnet, and a switch operated by the movement of said parts and controlling the circuit through the said magnet, substantially as described.

10. The combination with a pivoted lever, of an electromagnet for moving the same in one direction, a coiled spring for moving the same in the opposite direction, said lever having a short arm extending at an angle to the axis of the spring to which said spring is attached, a clock-train and a detent engaging the driving-wheel thereof and reciprocated by said lever, substantially as described.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

FRANK W. MOORE.

Witnesses:
W. CLYDE JONES,
M. R. ROCHFORD.