(No Model.)

C. D. WARNER.

SECONDARY ELECTRIC CLOCK MOVEMENT.

No. 363,440. Patented May 24, 1887.

Fig. 1.

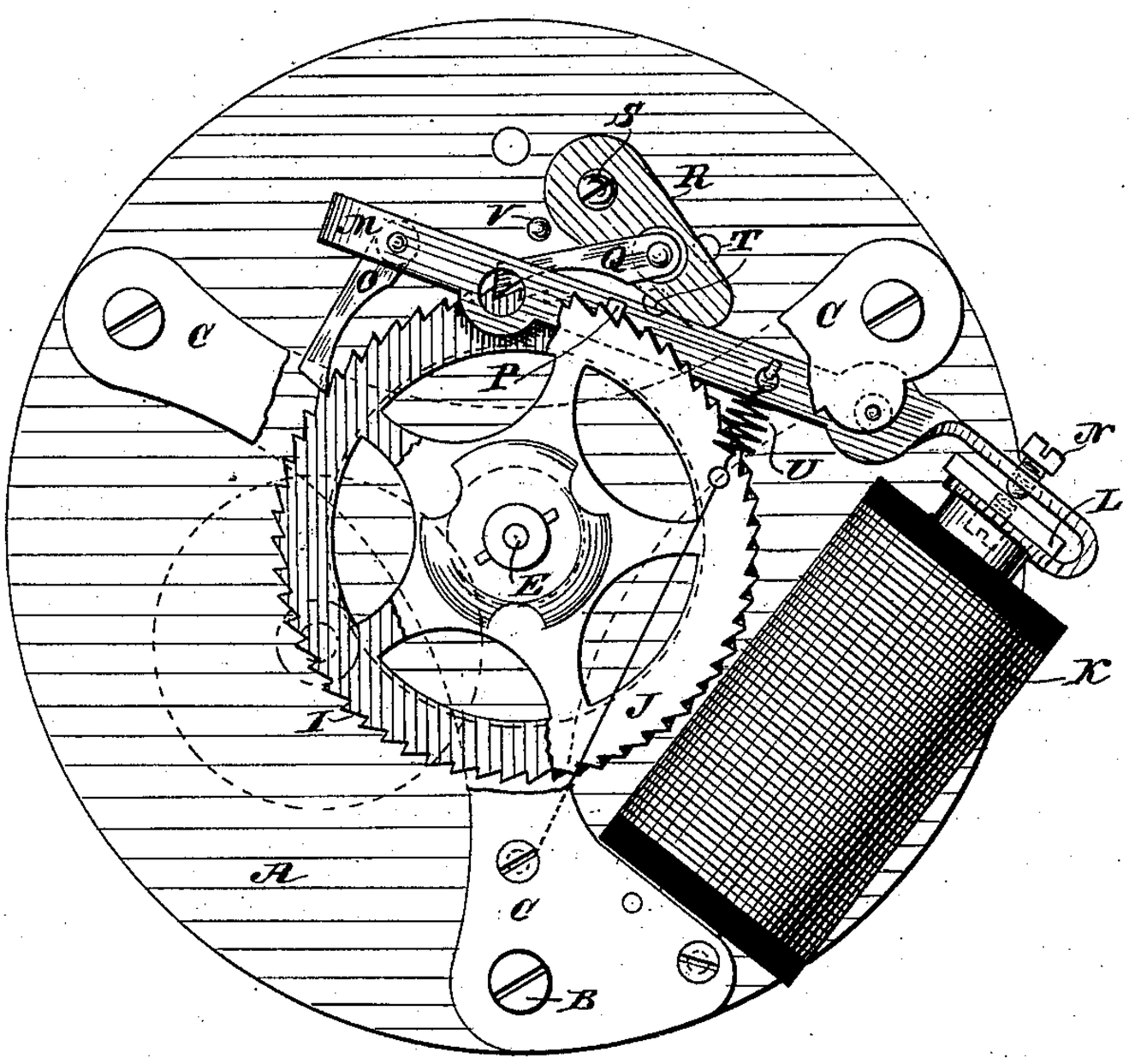
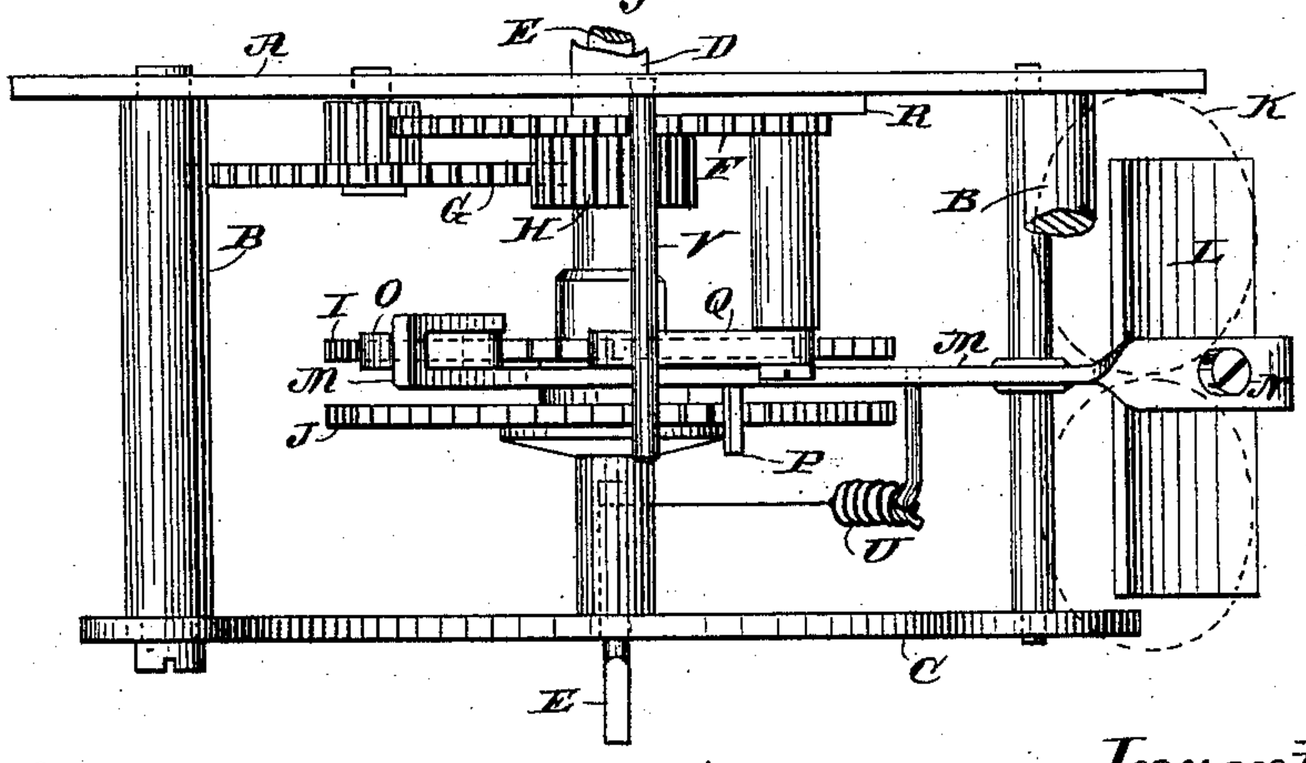


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SECONDARY ELECTRIC-CLOCK MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 363,440, dated May 24, 1887.

Application filed January 28, 1887. Serial No. 225,746. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. WARNER, of Ansonia, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Electric Clocks, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The present invention relates to that class of electric clocks known as "secondary" or "supplementary" clocks—that is, the clocks that are placed in circuit with others of the same kind and all operate from a common source—usually a standard clock or regulator adapted to properly open and close the circuit or circuits containing these service-clocks.

The object of the invention is to produce a secondary clock embodying the simplest form of adjustable construction practicable with the attainment of the utmost certainty and regularity of action.

The various features of improvements will be set forth in detail in the following description, and particularly designated in the claims to follow the description.

In the drawings, Figure 1 represents an elevation view of the works of a clock embodying my improvements; and Fig. 2 is a plan view of the same, parts of the frame of the work and one of the wheels being broken away to show underlying parts, and the actuating-magnet being omitted in the second figure.

A represents the dial-plate. The plate is constructed to receive any size of dial, as the works are adapted to all ordinary sizes of clocks.

B represents the frame-posts, and C the back plate of the frame.

D is the hour-hand shaft, which surrounds the minute-hand shaft E and is geared thereto in the usual way by the gear-wheels F G and pinion H on the minute-hand shaft.

I is a propelling-wheel, having the usual form of ratchet-teeth—sixty in number—and being fixed to the minute-hand shaft.

J is a retaining or stop wheel, which is frictionally attached to the hand-shaft, being of the same size as the wheel I and having the same number of teeth, but arranged oppositely to those of wheel I.

K is an electro-magnet, and L is the armature of the same, the armature being carried on the armature-arm M, which is pivotally supported upon the frame-work. This end of the armature-arm is bent back into a U shape, to the underneath part of which the armature L is secured, while an adjusting-screw, N, passing through the upper part, acts to force the parts away from each other or permit them to come together, and thereby adjust the armature to and from the poles of its magnet. The armature-arm passes forward to and between the wheels I and J and carries the gravity-pawl O, which is adapted to engage the teeth of the propelling-wheel I, these teeth being of the usual escapement or saw-tooth form. This armature-arm also carries the detent or stop P, which is adapted to engage the teeth of the stop-wheel J, these teeth being also of the escapement form, but beveled oppositely to those of the propelling-wheel.

Q is a retaining-pawl, arranged to engage the teeth of the propelling-wheel to hold it from retrograding, it being adjusted to drop in front of a tooth just before or as the propelling-pawl has reached the limit of its downward motion. This retaining-pawl is fixed to the radius-arm R, which is pivoted at S to the dial-plate. Holes T T on each side of arm R and in the dial-plate, or other like means, serve to receive the point of any suitable tool, by which a leverage action can be readily obtained against the arm R to move it on its pivot, and thereby cause the retaining-pawl to be adjusted relatively to the teeth of the propelling-wheel. A spring, U, connected to the frame of the works and to the armature-lever, acts to pull the lever down and carry the hands of the clock forward when the arm has been raised by the magnet and released by the cessation of the current. This spring is purposely made short, as shown, as thereby its action is made to be quick and positive, a condition that is essential to the effective operation of such clocks.

V is a stop-pin secured to the dial-plate, and located so that it serves to limit the upward movement of both the armature-arm and the retaining-pawl.

This arrangement of these parts is essential in various particulars. Thus it is to be no-

ticed that by using a second wheel like the propelling-wheel, but reversing its teeth, I am enabled to construct a simple and efficient stop upon the armature arm and arrange it so that it will not bear upon or engage the stop-wheel until such wheel has arrived at the point where it is desired to have it stopped—that is, the motion of the stop on the armature-arm is such that it enters the space in front of a tooth at the same proportionate rate of speed that the tooth advances, but without bearing upon the tooth, and so comes full in front of the next tooth, to positively and with certainty arrest the wheel when such next tooth comes in contact therewith. So, also, this stop serves to limit the downward movement of the armature-arm, and obviates a special stop for this purpose.

The use of the gravity-pawl on the armature-arm (as distinguished from a spring-actuated pawl) is important, in that it serves to prevent the advancement of the time indicating hands when the line containing such clocks is affected by lightning discharges—that is, such a discharge is very quick and sudden in its effect on the clock-magnets, causing the armatures to respond with a sharp snap-like blow, which, however, is not too quick to advance the clock when it is impelled by a spring-actuated pawl or similar device. In the present structure the armature-pawl is caused to drop in front of a tooth by gravity. It is also given a wide space in which to swing at its upper end, but prevented from turning over on its pivot by the bent end of the arm. When a sudden and short impulse, such as a lightning discharge, is sent over the line containing this mechanism, the pawl of the armature-arm will be thrown out from the impelling-wheel and up against the bent end of the arm, and, as the permitted swing of the pawl is much greater than the short play of the armature, the armature will return to its normal position before the pawl can fall back upon its wheel, so as to engage an advance tooth, the result being that no advancement of the hands will be caused from such effects. When the clocks are driven by the central or main office current, such current will be maintained so as to permit the impelling-pawl to fall back and in front of a new tooth on the impelling-wheel.

By supporting the retaining-pawl upon a radius-arm, as shown, it is possible to make very fine adjustments of the pawl with little effort and without the need of special skill, since it will be plain that a considerable movement of the radius-arm effects the relative position of the pawl to the impelling-wheel but slightly. So, too, further ease and simplicity of adjustment is secured by movably mounting the stop-wheel upon the main shaft, as this permits this wheel and the impelling-wheel to be adjusted relatively to each other.

What is claimed as new is—

1. In an electric clock, the combination, with the hand-actuating shaft, of a toothed propelling-wheel upon said shaft, a stop-wheel also upon said shaft and having its teeth oppositely inclined to those of the propelling-wheel, an electro-magnet, and an armature-arm arranged between said propelling and said stop wheel and provided with a pawl engaging and actuating said propelling-wheel and with a stop engaging said stop-wheel.

2. In an electric clock, the combination, with a shaft that carries or actuates the time-indicating hands, of a toothed propelling-wheel upon said shaft, a stop-wheel also upon said shaft, and having its teeth oppositely inclined to those of the propelling-wheel, an electro-magnet, an armature-arm arranged between said wheels and provided with a pawl engaging the former and with a stop engaging the latter, and a retaining-pawl arranged to prevent the backward movement of the wheels.

3. In an electric clock, the combination, with the hand-actuating shaft, of a toothed propelling-wheel fixed upon said shaft, a stop-wheel frictionally mounted upon said shaft, an electro-magnet, and an armature-arm constructed and arranged to engage the impelling-wheel for the purpose of advancing it and to engage the stop-wheel for the purpose of arresting the impelling-wheel, substantially as set forth.

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