E. WILSON.

Electric Clock.

No. 99,386. Patented Feb. 1, 1870.

Fig. 1.

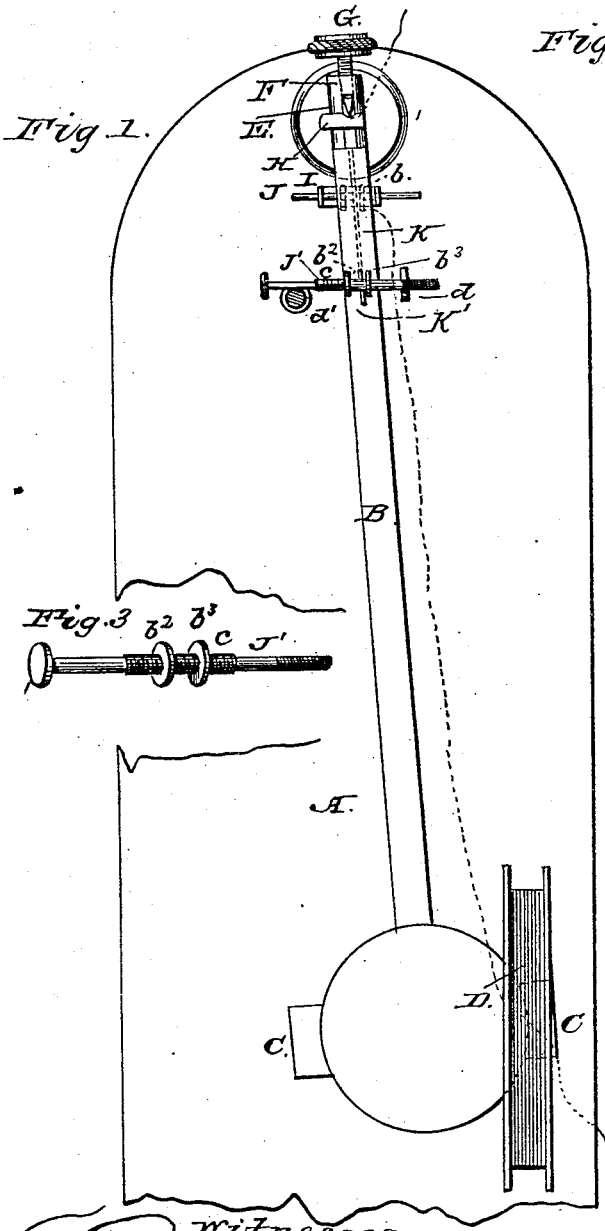

Fig. 2.

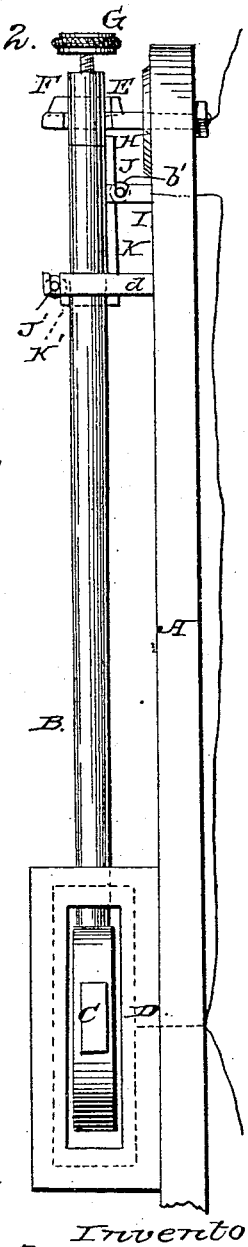

Fig. 3

Witnesses

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ELISHA WILSON, OF NEW YORK, N Y.

Letters Patent No. 99,386, *dated February* 1, 1870.

IMPROVEMENT IN ELECTRIC CLOCKS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ELISHA WILSON, of New York city, in the county and State of New York, have invented a new and useful Improvement in Electric-Clocks; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

The object of this improvement is to simplify the construction of electric-clocks, reduce their cost, and improve their accuracy as time-keepers.

Electric clocks as ordinarily made, are so arranged that the electric force acts at first to retard the motion of the pendulum and then to accelerate the same.

A serious difficulty connected with the use of such clocks is their inaccuracy as time-keepers.

I have discovered that this inaccuracy is due to the retarding effect of the electric impulse, such clocks being so constructed that the electric force acts against the pendulum before it has fully completed its oscillation in one direction, or before it has begun its return-movement.

I have also satisfied myself that it is impossible to make an accurate electric clock unless the pendulum is relieved of all retarding influences.

My invention consists in so applying the electric force to the clocks, that it will not retard the pendulum, substantially as hereinafter set forth.

My invention further consists in a novel adjustment for the circuit-slide and pendulum, substantially as hereinafter set forth.

Referring to the drawings—

Figure 1 is a front elevation of my invention.

Figure 2 is a side elevation of the same.

Figure 3 is a perspective view of the circuit-slide.

Similar letters of reference indicate corresponding parts.

A is the back board or support, to which the clock-movements and other parts are attached.

B, the pendulum, composed of wood, and carrying at its lower end a permanent bar-magnet C, of magnetized steel.

D is an electric-wire coil, of oblong form, so arranged that when the pendulum oscillates, one end of the magnet C will swing within the coil D.

The pendulum swings upon a knife-edge, E, passing through a slot, *a*, in the metallic ferrule or cap F, which covers the upper end of the pendulum.

Passing through cap F is a screw, G, which bears upon the knife-edge E.

By turning the screw G, the length of the pendulum is altered, and its oscillations regulated.

The knife-edge rests upon the upper surface of a slotted metallic stud, H, which projects from the back board A.

The rear end of the stud H is connected with one of the poles of the electric battery, the other pole being connected with the coil D. The oscillation of the pendulum is maintained by the electrical impulses which are made to pass through the coil D.

One end of the wire composing the coil D is connected with the electric battery; the other end of the coil extends up along the back board A, and communicates with the U-shaped bar of metal, the two fingers of which project from the back board and form supports, I, of the circuit-slide J. The latter consists of a bar of metal, which slides in recesses on the fingers of the support I.

The slide J is provided with two disks or shoulders, *b b'*, the face of one of which, *b*, is a conductor of electricity, the face of the other, *b'*, being a non-conductor. Between the shoulders *b b'* moves the edge of a thin metallic bar or conductor, K, which is attached to, and projects from the back of the pendulum, forming an electrical conductor between the slide J and the cap F, so that when the pendulum oscillates, the bar K will be alternately brought into contact with the shoulders *b b'*.

When the bar K touches the shoulder *b*, an electric impulse will pass from the battery through the coil D, support I, slide J, bar K, cap F, knife-edge E, and stud H.

When the bar K is not in contact with shoulder *b*, the electric current will be broken.

The form of the bar K is such that it will act upon the shoulders *b b'* under all adjustments of the pendulum made by screw G.

When the pendulum has completed its oscillation in the direction of the insulated disk on circuit-slide J, and is returning in the opposite direction, bar K comes in contact with the other disk, *d*, admits the current through coil D, in a direction that will present the same polarity as that of magnet C, which is thus repelled from the coil. The moment of contact with *d* can be effected at any point in the arc of oscillation by turning the disks *d* and *d'* apart or together.

A modified arrangement of the circuit-slide and its shoulders or disks is shown in fig. 3, in which J' is the slide and b^2 b^3 are parts or disks, which are made adjustable and movable upon the screw-thread C on the slide J'. The latter is supported upon two posts, *d d'*, one of which, *d*, is electrically connected with the main circuit. One end, *e*, of slide J' is covered with rubber, or otherwise made electrically non-conducting, so that when such non-conducting portion moves into contact with the electrical post *d*, the electric impulse will be cut off. The electrical connection with bar K is made by means of the bar K', which extends from K, and projects through the pendulum between the disks b^2 b^3, one of which, b^2, is a conductor, the

other a non-conductor. The electrical operation of the bar K and slide J′ is the same as before described in connection with slide J and bar K.

By adjusting the position of the disks b^2 b^3 to the rubber insulator *e*, the impulse of the electricity through the coil D, may be cut off before the pendulum has completed its oscillation towards disk b^2. This is to avoid extruding any influence of the coil opposed to the free initial and natural return of the pendulum toward the coil, as there might be if the circuit was only broken at b^2, as before described, in connection with slide J.

In carrying out my invention, I so apply the electric force that it can only accelerate but never at any moment retard the movement of the pendulum, viz: when after having attained its full arc it begins to return.

Heretofore, the electric force in repulsion has been opposed to the advancing pendulum and in attraction against it before completing the oscillation, because put on or cut off at a fixed point without regard to the ever-changing length of the arc. If this occurs but for an instant, the time, length of arc, and velocity will each be as variable and inconstant as the interposed force, which with the battery-current is inconstant, making the times of unequal duration; but when unopposed, the pendulum is free to gravitate to the extent of its natural arc, then the velocity and distance will vary with the force, but the time will remain constant in an arc of ten degrees. I have also found that of every ten degrees of force employed to impel the pendulum, from six to eight degrees were expended in overcoming inertia and momentum, and were consequently lost. The remaining two to four-tenths rightly applied, as above, being ample to keep up the oscillations of the pendulum. My improvement, therefore, forms an automatic adjustment of the initial movement of impulse to the variable length of the arc, by the application of the electric force or impulse to the pendulum when, after arriving at the extreme limit of the arc, it has begun to return, instead of applying the force at a fixed point at the moment, or just before it comes to a stop, thus rendering the time constant, while the battery power, velocity, and length of arc are variable.

I do not limit or confine myself to the use of the particular form and construction of devices herein shown, as they may be altered and modified in many ways without departing from my invention.

Having thus described my invention,

I claim as new, and desire to secure by Letters Patent—

1. The arrangement, as shown and described, of instrumentalities, whereby the electric impulse is applied to the pendulum after it has reached the limit of its arc, and when its backward movement is begun, all as set forth.

2. The slide J, provided with two disks, b b^1, one of which is a conductor and the other a non-conductor, and caused to operate upon the conductor K, at the time and in the manner described.

3. The vibrating conductor K, arranged between the slide J and cap F, as and for the purpose specified.

4. The conductor K, in combination with the circuit-slide and the pendulum-adjustment, so as to permit vertical adjustment of the pendulum, without disturbing the electrical action, substantially as herein set forth.

5. The adjustable knife-edge, in combination with the pendulum, substantially as herein described, for the purpose of an electric-clock.

Witnesses: ELISHA WILSON.

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