(No Model.)

F. & O. HAENICHEN.

ELECTRIC PENDULUM CLOCK.

No. 342,086. Patented May 18, 1886.

Fig. 1.

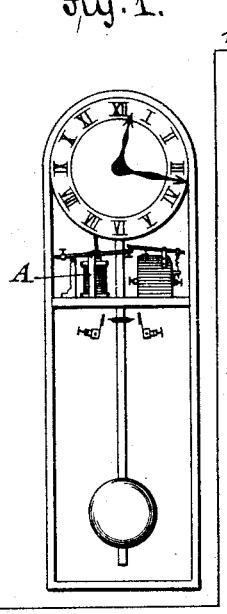

Fig. 3.

Fig. 2.

WITNESSES

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FRIEDRICH HAENICHEN AND OTTO HAENICHEN, OF PHILADELPHIA, PA., ASSIGNORS TO THEMSELVES, AND OSCAR SEEBASS, OF NEW YORK, N. Y.

ELECTRIC-PENDULUM CLOCK.

SPECIFICATION forming part of Letters Patent No. 342,036, dated May 18, 1886.

Application filed September 18, 1885. Serial No. 177,423. (No model.)

To all whom it may concern:

Be it known that we, FRIEDRICH HAENICHEN and OTTO HAENICHEN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric-Pendulum Clocks, of which the following is a specification.

This invention has reference to certain improvements in the electric-pendulum clock for which Letters Patent have been granted to us, No. 316,360, dated April 21, 1885, the improvements being designed with a view to simplify the construction of the clock; and the invention consists of certain details of construction and combination of parts, which will be more fully described hereinafter, and finally be pointed out in the claims.

In the accompanying drawings, Figure 1 represents a front elevation of our improved electric clock. Fig. 2 is a front elevation of the operative parts of the same, drawn on a larger scale; and Fig. 3, a front view of the hand-actuating mechanism.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents an electro-magnet that is supported below the clock mechanism and provided with a nicely-balanced armature, A′, which is fulcrumed to vertical standards A^2. The armature A is provided with a lever, *a*, having a contact-screw, a', at one end and an adjustable weight, a^2, at the opposite end. The weighted end of the armature forms contact with an upright post, A^3, that is covered with leather or felt, so that the contact of the armature-lever *a* with said post takes place in a noiseless manner. The armature A′ is further provided with an upwardly-extending lever-arm, C, having a plate, *d*, at its upper end, that forms intermittent contact with the shorter arm of an oscillating crutch, D, that is fulcrumed to a steel pivot, *d′*, while the longer arm of the crutch D engages, by a pin, d^2, the clock-pendulum P. The longer arm of the crutch D is provided with a fixed arm, d^3, extending at right angles thereto, said arm being provided with an adjustable weight, d^4. (Shown in Fig. 2.) The crutch D after being lifted by the lever-arm C is returned by the weight d^4, so that the crutch D engages the pendulum P by the projecting pin d^2, and imparts an impulse to the same, so as to oscillate it toward the right. The armature A′ is attracted by the electro-magnet A when the pendulum closes the contacts at one side, by which the battery-circuit is closed. The attraction of the armature A′ moves the lever-arm C sidewise, and imparts a lateral oscillation to the crutch D. On the breaking of the circuit the armature A′ is released and the arm C moved back, whereby the crutch D is dropped and another impulse given to the pendulum. The return motion of the crutch D is arrested by a fixed stop-pin, $f^\times$. The lever-arm C also imparts, by a pivot-pawl, *c*, intermittent rotary motion to a ratchet-wheel, *c′*, which latter transmits, by a worm-gear, c^2 c^3, vertical shaft e^4, and bevel-gears e^5 e^6 rotary motion to a horizontal shaft, e^7, which operates the minute and hour hands of the clock by the usual gearings, which are not shown in the drawings. The pendulum P is suspended from a horizontal supporting-plate, S, by a flat spring, *s*. The supporting plate S is connected by a conducting-wire, 1, with the coils of the electro-magnet A, and the spring *s* by a conducting-wire, 2, passing through the pendulum, with knife-edged platinum contacts *b b′*, that extend laterally from the pendulum P. The platinum contacts *b b′* form by the oscillations of the pendulum alternately contact with knife-edged platinum contacts *f f′*, which are applied to the upper ends of springs *g g′*. The spring *g* is connected with the positive pole of the battery, while the spring *g′* is connected with the negative pole of the same. The knife-edged contacts *b f* and *b′ f′* are arranged at right angles to each other, so that the contacts take place at extremely small points, so that, consequently, the current exerts but little wear on the same. The pendulum P is further provided at points intermediately between the suspending-spring *s* and the contact-pieces *b b′* with fixed projections *h h′*, which extend in opposite directions and are not electrically connected with the battery. Sidewise of the projections *h h′* are arranged at each side of the pendulum a pair of springs, *i i′* and *l l′*, which are provided with

knife-edged platinum contacts *m m'* and *n n'*, that are also placed at right angles to each other, so as to diminish the contact-surface as much as possible. The platinum contacts *m m'* touch each other when the pendulum arrives at one end and the contacts *n n'* when the same arrives at the other end of its oscillation. The springs *i* and *i'* and *l* and *l'* are insulated from each other, the spring *l* being connected by a conducting-wire, 3, to the binding-post, g^2 of spring *g'* and to the negative pole of the battery, and the spring *l'* by wire 4 with one end of the coils of the electro-magnet, as shown in Fig. 2. The spring *i* is connected by wire 5 with the binding-post g^3 of spring *g*, and the positive pole of the battery and the spring *i'* by wire 6 with the binding-post o^2 of a disconnector, F. The screw *a'* at one end of the armature-lever *a* forms contact with the end of the fulcrumed lever F' of the disconnector F, which is connected at its opposite end by a spiral spring, *o*, with a bracket-plate, *o'*. The disconnector-lever F has a knife-edged platinum contact, *p*, which forms contact with a knife edged platinum contact, *p'*, the latter being connected by a conducting-wire, 7, and binding-post p^2 to the same end of the coils of the electro-magnet to which the conducting-wire 4 is attached, while the conducting-wire 1 is connected to the opposite end of the coils, as shown in Fig. 2. When the pendulum arrives at the end of its oscillation from right to left, the connection of the springs *l l'* and of the contacts *b f* is obtained, whereby the circuit is closed and the armature attracted as the current flows from the positive pole of the battery to the spring *g*, contacts *f* and *b*, wire 2, spring *s*, and wire 1 to the coils of the electro-magnet through the same and over wire 4, springs *l l'*, and contacts *n n'* and wire 3 to the binding-screw g^3 and back to the negative pole of the battery. The armature A is thereby attracted, the lever-arm C oscillated toward the right, and the crutch D lifted by being moved away from its stop-pin $f^\times$. While the pendulum swings from the left to the right, the connections of the platinum contacts *b f* and *m m'* are interrupted and the circuit is broken. The armature, however, remains still attracted by the residual magnetism in the cores of the electro-magnet A, whereby the crutch D is retained by the lever-arm C in raised position without acting upon the pendulum. When the pendulum arrives at the end of its oscillation from left to right, the platinum contacts *b' f'* and *i i'* are connected with each other, which causes the battery-current to flow in a reverse direction through the coils of the electro-magnet, the current passing from the positive pole of the battery, binding-screw g^3, wire 5, springs *i i'*, wire 6, binding-screw o^2, bracket *o'*, spring *o*, disconnector-lever F', contacts *p p'*, wire 7 to the coils of the electro-magnet, then through the same to the conducting-wire 1, supporting-plate S, spring *s*, wire 2, contacts *b' f'*, and binding-post g^2 to the negative pole of the battery. The reversal of the current in the coils of the electro-magnet neutralizes the residual magnetism in the cores of the armature, so that the latter is dropped to its normal position. Simultaneously with the dropping of the armature the contacts *p p'* of the disconnector-lever F are separated and the circuit broken. The dropping of the armature A' causes the lever-arm C to release the crutch, so that it drops and imparts an impulse to the pendulum, which oscillates it from the right to the left. The crutch D is stopped by striking against its stop-pin $f^\times$, which has the advantage that an impulse of uniform strength is imparted to the pendulum. As the circuit is closed for an extremely short time only at the ends of each oscillation of the pendulum, the battery is but slowly consumed and capable to act for a considerable length of time without requiring refilling, whereby the running expenses of the clock are reduced to a great degree.

The advantages are as follows: first, the absolute neutralization of the residual magnetism by the reversal of the current in the coils of the electro-magnet; second, the prompt and effective dropping of the armature and the instant interruption of the circuit; third, the considerable saving in battery-power by the use of a weak battery and consequently reduced oxidation at the contact-pieces.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

The combination of an oscillating pendulum, P, having contact-pieces *b b'* and lateral projections *h h'*, springs *g g'*, having contact-pieces *f f'*, springs *i i'* and *l l'*, having contacts *m m'* and *n n'* arranged sidewise of the pendulum, electro-magnet A, armature A', disconnector F F', operated by the armature, said contact-springs, electro-magnet, and disconnector being in circuit with the pendulum, so that at one oscillation of the pendulum the current is passed in one direction and at the next oscillation in a reverse direction through the coils of the electro-magnet, substantially as set forth.

In testimony that we claim the foregoing as our invention we have signed our names in presence of two subscribing witnesses.

FRIEDRICH HAENICHEN.
OTTO HAENICHEN.

Witnesses:
PAUL GOEPEL,
OSCAR SEEBASS.