(No Model.) 2 Sheets—Sheet 1.

# H. BURGER & W. H. McFALL.

## ELECTRIC METER.

No. 571,037. Patented Nov. 10, 1896.

Fig. 1.

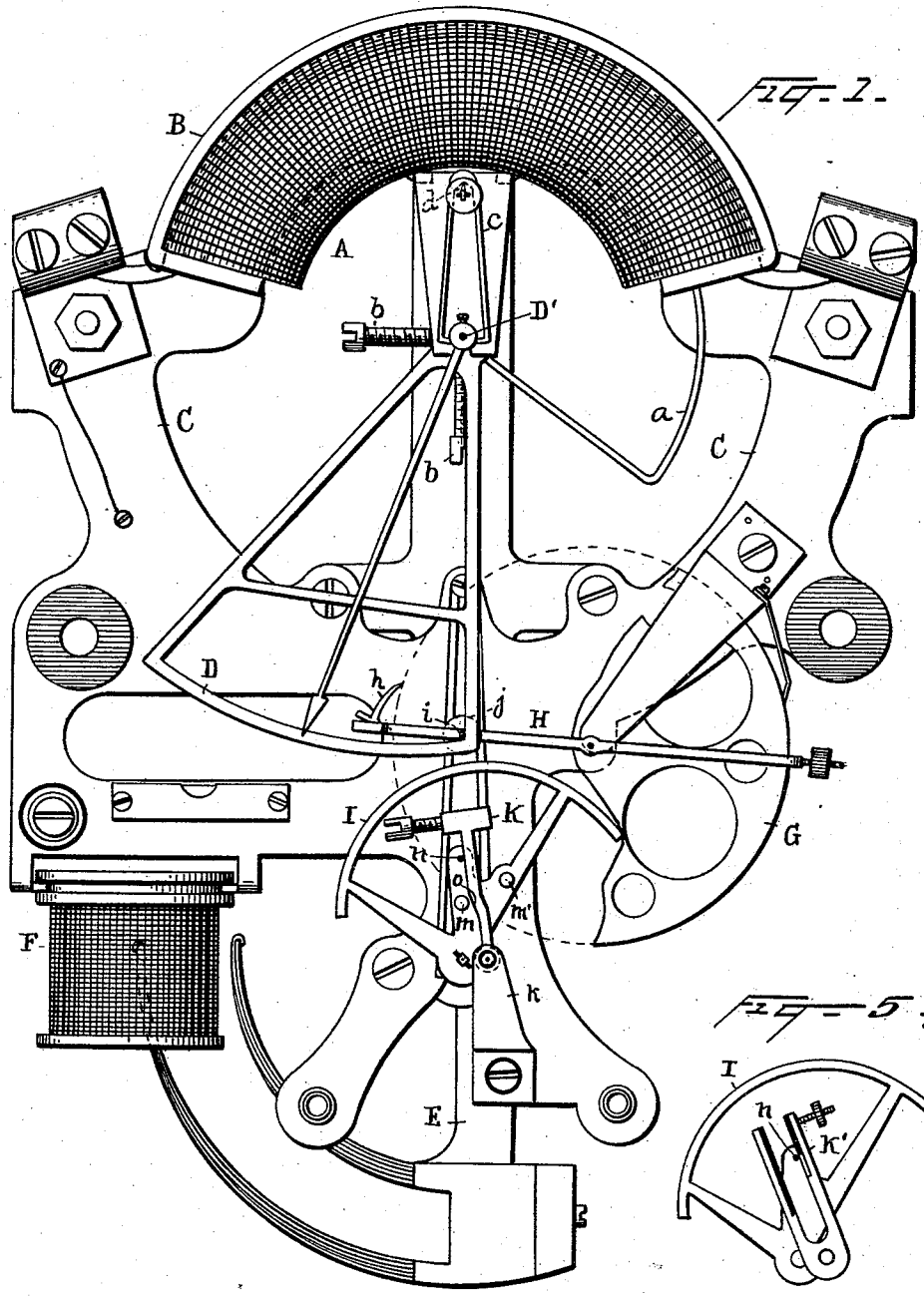


Fig. 5.




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(No Model.) 2 Sheets—Sheet 2.

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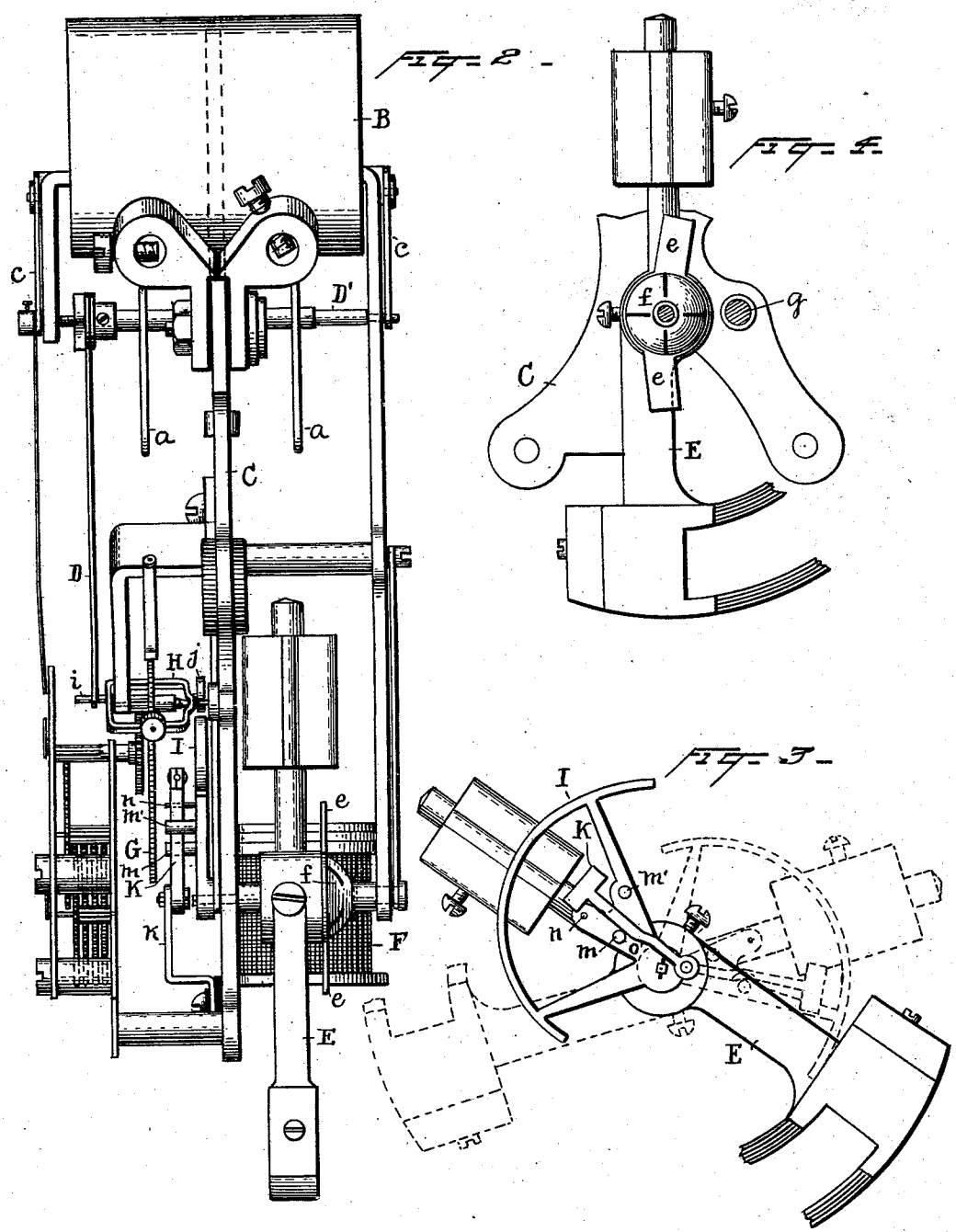


Witnesses
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# UNITED STATES PATENT OFFICE.

HERMAN BURGER AND WILLIAM H. McFALL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE AMERICAN ELECTRIC METER COMPANY, OF SAME PLACE.

## ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 571,037, dated November 10, 1896.

Application filed March 7, 1896. Serial No. 582,296. (No model.)

*To all whom it may concern:*

Be it known that we, HERMAN BURGER and WILLIAM H. McFALL, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Electric Meters, of which the following is a specification.

Our invention relates to electric meters having as their actuating element an oscillating electric motor comprising a pendulum carrying armatures and also carrying an overbalanced circuit-controller and an operating-solenoid. This motor has a uniform rate of oscillation, although the amplitude of the swing of the pendulum may vary to some extent. The pendulum also carries an oscillating cam, which operates in one direction of movement and with a gradually-decreasing speed a pawl which actuates the driving-wheel of a register-train. The extent of movement of this pawl at each oscillation of the pendulum, and hence the extent to which the register-train will be moved, is controlled by a cam which is moved by a current-indicator consisting of one or two solenoids and suitable coacting cores. The cam adjusted by the current-indicator limits the return movement of the pawl, whose forward movement is effected by the cam which oscillates with the pendulum. The cam adjusted by the current-indicator permits a greater or less backward movement of the pawl, according to the strength of the current being measured, and since the driving-cam always moves the pawl forward to the same point the extent of movement of the pawl is determined by the extent of the retracted movement which is permitted by the cam adjusted by the current-indicator. These are the principal features of the meter upon which our improvement is ingrafted.

The object of our invention is to simplify and cheapen the construction of the meter and to make it more certain and accurate in operation.

The invention consists in the several features and combinations of parts hereinafter described, and pointed out by the claims.

In the accompanying drawings, Figure 1 is a front elevation of the meter with the register-train omitted and removed from the inclosing box. Fig. 2 is a side elevation of the meter. Fig. 3 is a view illustrating the position of the circuit-controller at the extreme limits of the swing of the pendulum. Fig. 4 is a section through the pendulum-shaft, looking at the rear side of the pendulum and showing the frictional retarding device; and Fig. 5 is a view illustrating a modified form of the circuit-controller.

The curved solenoids A are supported by a curved metal shield B, which is provided with inwardly-bent ends of flanges by means of which the solenoids are held within the shield, and between the solenoids and the shield is placed a layer of insulation. This shield is of brass or other suitable non-magnetic metal. The frame supporting the operating parts of the meter is a flat plate C, which may be stamped out of brass, this frame having a curved upper portion which passes between the solenoids and under the shield B.

D is an inverted arch-shaped cam which is carried by the shaft D', which in turn carries the cores *a*, working in the solenoids, and the weights *b*. This indicator-shaft D' is supported by stirrups *c*, which form a rolling bearing. These stirrups are hung upon knife-edges *d*, (shown in dotted lines in Fig. 1,) which make the indicator more sensitive in its movements than the former constructions in which these stirrups were pivoted by screws in the ordinary way.

E is the pendulum of the motor, and F is the operating-solenoid. The pendulum is prevented from hammering at the extreme limits of its movement by a two-armed plate *e*, held by a friction-disk *f* on its shaft. The arms of the plate *e* strike the stationary bar *g* as the pendulum approaches the extreme limits of its movement, and by turning the plate on the shaft under the friction-disk a frictional retardation is produced without any spring action tending to quicken the return movement of the pendulum.

G is the driving ratchet-wheel of the register-train. It is driven by a pawl *h* on an overbalanced frame H. This frame has a pin *i*, engaging the indicator-cam D. The oscillating cam I, carried by the pendulum-shaft,

engages a roller *j* on the frame H, lifting that frame a distance which is determined by the adjustment of the indicator-cam. The driving-cam I, instead of being arranged to lift the frame H on the forward or attracted movement of the pendulum, is reversed and lifts that frame and drives the register-train on the return or backward swing of the pendulum. This makes the motor start easier from a position of rest, since it is required to do no work on the forward or attracted swing of the pendulum.

The overbalanced circuit-controller is composed of a lever K, which is pivoted to a stirrup *k* at a point which is in the rear of the axis of the pendulum-shaft. This lever K plays between two pins *m m'*, of insulation, carried by the driving-cam I and also engages in one position metal pin *n*, also carried by the driving-cam. A shoulder *o* on the lever K coacts with the insulating-pin *m* to prevent contact between the lever K and pin *n* on the backward swing of the pendulum. In the position of rest the lever K, by reason of the eccentric position of its pivot relative to the pendulum-shaft, rests upon the pin *n* and completes the circuit. The pendulum swings forward under the attraction of the current until the lever K topples over against the insulating-pin *m'*, when the circuit is broken and the pendulum begins its return swing. As it swings past the center the lever K falls over in the other direction, but the shoulder *o* strikes the insulating-pin *m* and prevents the lever from touching the pin *n*. On the next forward movement of the pendulum the shoulder *o* slides over the pin *m* as the pendulum approaches its central position, and contact is reëstablished with the pin *n*, thus giving the pendulum a forward impulse under the attraction of the solenoid. The circuit-controller is of simplified construction, consisting only of the single part coacting with the insulating and metal pins on the driving-cam.

The form of circuit-controller illustrated in Fig. 5 embodies the same ideas in a modified form and accomplishes the same result. In this form the lever K' (corresponding to K) is a fork and coöperates with the pin *n* on the driving-cam. The insulating-pins *m m'* on the driving-cam are not required, because the insulating sides of the fork act as stops.

What we claim as our invention is—

1. In an electric meter, the combination with an oscillating electric motor and a register, of a driving device for driving the register, which operates only on the backward or unattracted swing of the motor, substantially as set forth.

2. In an electric meter, the combination with a pendulum and an operating-solenoid forming an oscillating electric motor, of a register-train, a cam carried by the pendulum and driving the register-train on its backward or unattracted swing, a current-indicator, and means controlled by the current-indicator for determining the extent of movement of the register produced by the driving-cam, substantially as set forth.

3. In an electric meter, the combination with an oscillating electric motor, and a contact-pin carried thereby, of an overbalanced eccentrically-pivoted lever coöperating with said contact-pin and closing the motor-circuit when the motor is at rest and throughout a portion only of its forward movement, substantially as set forth.

4. In an electric meter, the combination with an oscillating electric motor, a register and a driving-cam, of a contact-pin carried by said driving-cam and an overbalanced eccentrically-pivoted lever coöperating with said contact-pin and closing the motor-circuit when the motor is at rest and throughout a portion only of its forward movement, substantially as set forth.

5. In an electric meter, the combination with an oscillating electric motor, of an overbalanced circuit-controller consisting of insulating and metallic pins carried by the oscillating motor, and a lever pivoted eccentrically and provided with a shoulder coöperating with one of the insulating-pins to prevent closing the circuit on the backward swing of the motor, substantially as set forth.

6. In an electric meter, the combination with an oscillating electric motor, a register-train and an oscillating driving-cam carried by the motor and driving the register-train intermittently, of pins *m*, *m'*, *n* on the driving-cam, and the eccentrically-pivoted lever K having a shoulder *o*, substantially as set forth.

7. In an electric meter, the combination with an oscillating electric motor, of the plate *e* on the motor-shaft, and the friction-disk *f* for producing a frictional retardation of the motor at the extreme limits of its swing, substantially as set forth.

8. In an electric meter, the combination with the current-indicator, the oscillating electric motor, and the register, of the flat supporting-plate C, upon the opposite sides of which the motor and register are supported, and the upwardly-curved metal shield B at the top of the plate C and supporting the indicator-coils, substantially as set forth.

This specification signed and witnessed this 23d day of January, 1896.

HERMAN BURGER.
WILLIAM H. McFALL.

Witnesses:
WM. A. SHRYOCK,
WM. B. JONES.