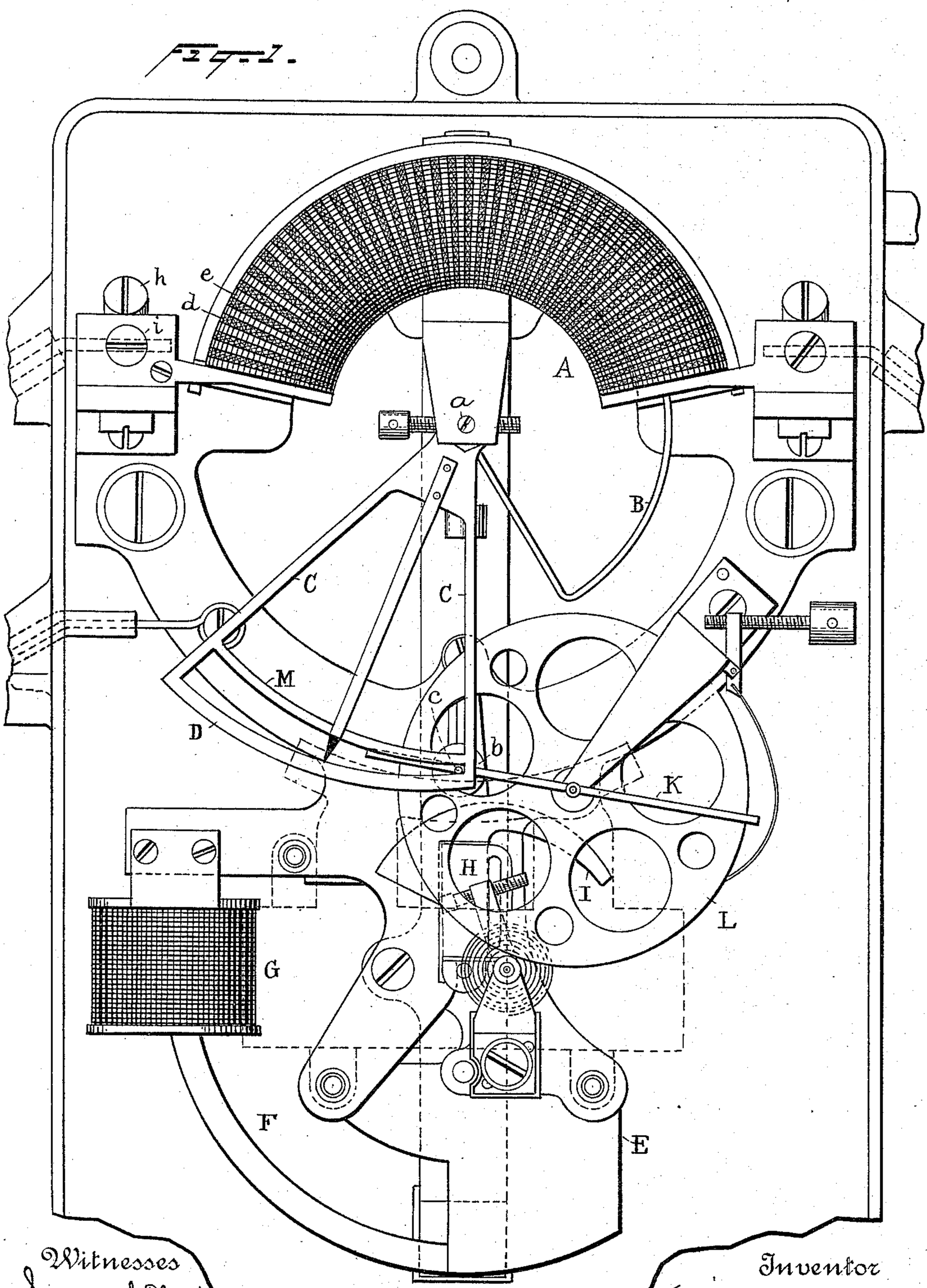
(No Model.) 2 Sheets—Sheet 1.

W. D. MARKS.

ELECTRIC METER.

No. 573,021. Patented Dec. 15, 1896.

Fig. 1.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

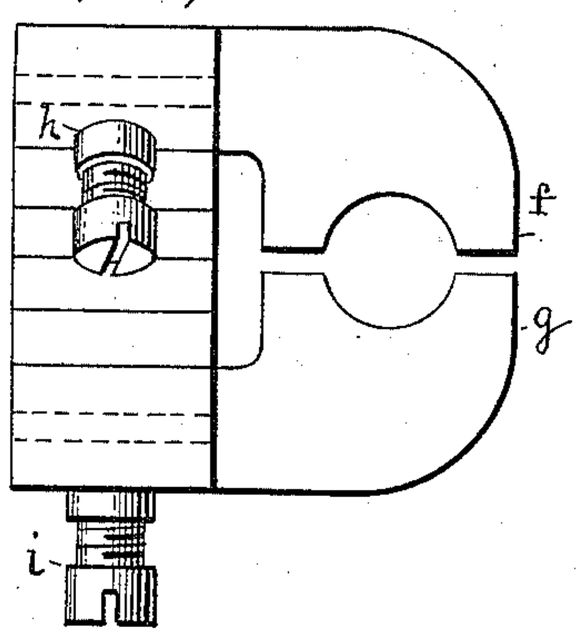
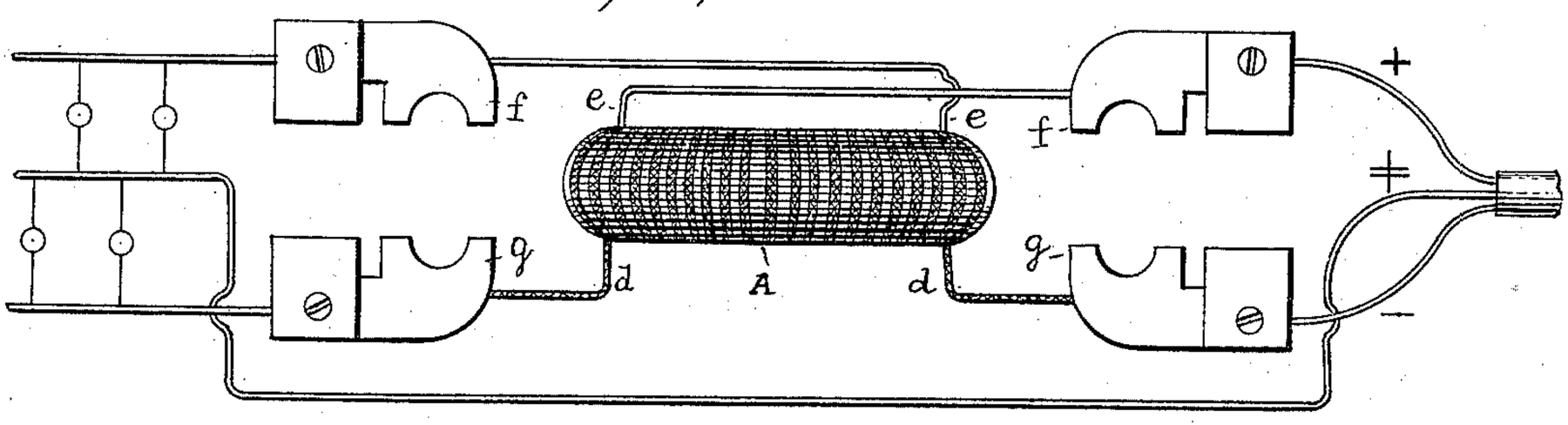


Fig. 3.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM D. MARKS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE AMERICAN ELECTRIC METER COMPANY, OF SAME PLACE.

ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 573,021, dated December 15, 1896.

Application filed October 20, 1896. Serial No. 609,422. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. MARKS, a citizen 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.

The object I have in view is to simplify the construction and increase the efficiency in operation of electric meters wherein a chrono-electric motor transmits its movement intermittently to a register to an extent which is controlled at each movement by an ampere-meter.

In the accompanying drawings, forming a part hereof, Figure 1 is a front elevation of the meter. Fig. 2 is a top view of the supports for one end of the ampere-meter solenoid, and Fig. 3 is a diagram showing the preferred method of connecting the solenoid-wires.

A is the solenoid of the ampere-meter.

B is the core, which enters the solenoid A and which is carried by a pivot at *a*, upon which is also mounted the inverted arch composed of divergent side pieces C, connected at their lower ends by an arc or cam D, which is eccentric to the pivot *a*. The chrono-electric motor is composed of a pendulum E, carrying a solenoid-core F, which is attracted by a solenoid G, the current to which is controlled by a circuit-controller H. The shaft of the chrono-electric motor carries a cam I, which lifts an antifriction-roller *b*, attached to a pawl-arm K, which pawl-arm moves in one direction a ratchet-wheel L, which is the first wheel of the register-train. The pawl-arm K carries on its inner end a pin *c*, which rests on the upper surface of the arc D, which limits the falling movement of the pawl-arm. At each return movement of the pendulum the cam I raises the pawl-arm and frees the pin *c* from the arc D, permitting the ampere-meter to swing the arc freely to a position determined by the current flowing at the time through the solenoid A. In the initial position of the arc, when no current is flowing through the solenoid A, as illustrated in Fig. 1, the cam I lifts the pin *c* so as to just clear the arc D, but does not move the pawl-arm sufficiently to turn the ratchet-wheel L. When current flows through the solenoid A, the arc D is adjusted farther to the right, permitting the pawl-arm to fall to a lower position, so that when lifted by the cam I the pawl-arm will be moved a sufficient distance to move the ratchet-wheel L, and this distance is greater as the movement of the arc D to the right is greater, as will be understood.

So far as described the electric meter is of the well-known construction.

My improvement is embodied in the features now to be described.

Connecting the side pieces C of the inverted arch above the eccentric arc D is placed a concentric arc M. This is located at such a distance from the pivot *a* that each time the pawl-arm K is raised by the motor-cam I the pin *c* will strike the concentric arc M at the upper limit of its movement just enough to loosen the pivot *a*. The effect of this "tapping" of the ampere-meter is highly advantageous. In using ampere-meters it has been found desirable in practice, in order to obtain quick and accurate readings, to tap them with the finger, thus eliminating friction and causing the needle to come to rest more quickly. By my improvement this is accomplished automatically in the electric meter. The shaft of the ampere-meter upon which the inverted arch is hung is thus always being loosened in its bearings and friction is thereby eliminated, and in addition the continual jarring tends also to eliminate the magnetic lag or hysteresis.

Further, with electric meters of the type herein described it has been found heretofore that when a number of lights are turned on simultaneously the arch would swing through a large angle and be some time in coming to rest. By my improvement the pin *c*, playing between both the eccentric and concentric arcs and striking both of them at the limits of its movements, the excessive swinging of the arch is prevented and a "dead-beat" movement is secured. Still further, by my improvement, the pawl-arm being limited in its upward movement by the concentric arc, any tendency of the pawl-arm to overthrow is prevented.

Meters of the type referred to herein, when constructed for employment upon a three-wire system, have heretofore been provided with two separate ampere-meter solenoids working on two separate cores attached to the same shaft. I propose to do away with one solenoid and one core by winding the wires *d e* of the ampere-meter in one solenoid-core, the wires being wound side by side, so as to be maintained the same distance from the core. This is the construction of the solenoid A illustrated in the drawings. It is made in the form of an arch, as heretofore, being supported at its ends on abutments to which the ends of the wire are attached. With the double-wound solenoid these abutments are divided into two parts *f g*, Fig. 2. The end of the solenoid rests upon the flat surface of the divided abutment, surrounding the circular opening between the approaching ends of the two parts *f g*. The end of one wire is soldered or otherwise fastened to the part *f* of the abutment and the end of the other wire is similarly fastened to the part *g* of the abutment. These abutments are provided with sockets *h i* for receiving the circuit-wires. These will be connected so that the current from the positive conductor of the three-wire system will pass through the solenoid in the same direction as the current from the negative conductor of the three-wire system, the effect of the two currents being cumulative and the core of the ampere-meter being moved by their joint or cumulative action. It will be understood, of course, that if more than two currents are to be measured the ampere-meter solenoid will be wound with more than two wires and will be supported upon abutments divided into more than two parts. By this improvement the construction of the meter is simplified and better results are obtained than when separate solenoids and cores are employed.

I prefer to cross the connections of one of the solenoid-wires, as illustrated in Fig. 3, so that the plus and minus wires from the street can enter the meter on the same side. This figure illustrates the abutments moved away from the ends of the solenoid for clearness. The ends of the wire *d* are secured directly to the abutments *g*, upon which the solenoid is supported, while the ends of the wire *e* are carried to the opposite abutments *f*.

What I claim as my invention is—

1. In an electric meter, the combination with a controlling ampere-meter, of means for automatically tapping the ampere-meter, substantially as and for the purpose set forth.

2. In an electric meter, the combination with a controlling ampere-meter, a register and a motor which intermittently acts on the register to an extent controlled by the ampere-meter, of means operated by the motor for automatically tapping the ampere-meter, substantially as set forth.

3. In an electric meter, the combination with a controlling ampere-meter and an eccentric arc or cam moved thereby, of a pawl-arm operating a register, and a motor acting intermittently on the pawl-arm through a distance controlled by the adjustment of the ampere-meter, said pawl-arm being limited in both directions of its movement by said ampere-meter, whereby the ampere-meter has a dead-beat movement and the overthrow of the pawl-arm is prevented, substantially as set forth.

4. In an electric meter, the combination with a controlling ampere-meter and a register-operating pawl-arm, of an eccentric arc or cam and a concentric arc moved by the ampere-meter, the pawl-arm playing between the eccentric and concentric arcs and striking such arcs at the limits of its movement, substantially as set forth.

5. In an electric meter, the combination with the ampere-meter and the register-operating pawl-arm, of the inverted arch composed of a frame having side pieces C, the eccentric arc or cam D and concentric arc M, substantially as set forth.

6. In an electric meter, the combination with a register and a motor acting intermittently on the register, of a controlling ampere-meter determining the extent of the movement of the register by the motor, said ampere-meter having a single solenoid-core and a single solenoid-coil wound with two or more separate wires connected so that the two or more currents act cumulatively upon the core, substantially as and for the purpose set forth.

7. In an electric meter provided with a controlling ampere-meter adapted to receive the currents of two or more circuits, the combination with the ampere-meter core, of the arch-shaped solenoid-coil wound with two or more wires, and the divided abutments upon which the solenoid-coil is supported and to which the ends of the wires are separately connected, substantially as set forth.

8. In an electric meter provided with a controlling ampere-meter adapted to receive the currents of two or more circuits, the combination with the ampere-meter core, of the arch-shaped solenoid-coil wound with two or more wires, and the divided abutments upon which the solenoid-coil is supported and to which the ends of the wires are separately connected, the connection of one of the wires with the abutments being crossed, substantially as set forth.

This specification signed and witnessed this 9th day of October, 1896.

WM. D. MARKS.

Witnesses:
G. ALBERT SMYTH,
C. THEO. BUCHHOLZ.