(No Model.)

J. F. OTT & A. E. KENNELLY.

ELECTRIC CURRENT METER.

No. 479,172. Patented July 19, 1892.

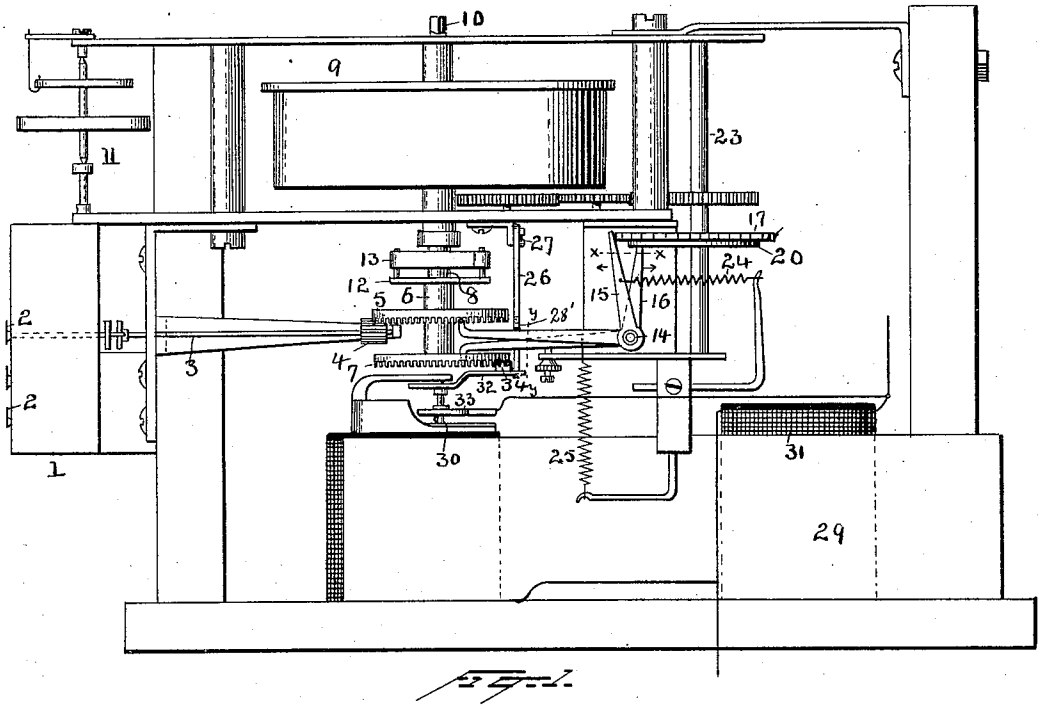

Fig. 1.

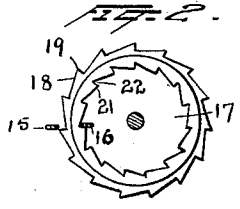

Fig. 2.

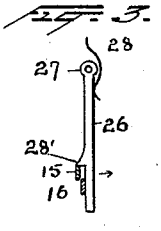

Fig. 3.

Witnesses
Norris A. Clark.
W. F. Oberly

Inventors
J. F. Ott & A. E. Kennelly
By their Attorneys
Dyer & Seely.

UNITED STATES PATENT OFFICE.

JOHN F. OTT AND ARTHUR E. KENNELLY, OF ORANGE, NEW JERSEY, ASSIGNORS TO THE EDISON GENERAL ELECTRIC COMPANY, OF NEW YORK, N. Y.

ELECTRIC-CURRENT METER.

SPECIFICATION forming part of Letters Patent No. 479,172, dated July 19, 1892.

Application filed November 30, 1891. Serial No. 413,461. (No model.)

To all whom it may concern:

Be it known that we, JOHN F. OTT, a citizen of the United States, and ARTHUR E. KENNELLY, a subject of the Queen of Great Britain, residing at Orange, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Electric-Current Meters, of which the following is a specification.

The present invention constitutes an improvement on the meter described in our application, Serial No. 405,051, filed September 7, 1891, and relates to that class of electrical meters in which suitable recording or indicating counters are moved forward at frequent intervals by a clockwork or motor mechanism, the extent of movement of the counters depending on the strength of the current in the circuit at the moment when the mechanism is brought into operation to move said counters.

The main object of this invention is to provide a simple and practicable mechanism for advancing the counters at each operation a distance exactly dependent on and corresponding to the current strength and then to disengage the driving mechanism from the meter.

The invention relates more especially to the means for placing the motor in engagement with the recording device and for disengaging the driving connection at the proper moment.

In the accompanying drawings, Figure 1 is a side view of the meter with the inclosing case removed. Fig. 2 is a bottom view of the operating cams and levers operated thereby, said levers being broken on the line $x\,x$, Fig. 1. Fig. 3 is a side view of a pivoted detent-lever, showing, also, the position of the pivoted operating-levers on line $y\,y$, Fig. 1.

Referring to Fig. 1, 1 is a box or case, within which is any suitable arrangement of mechanism for advancing the hands or pointers 2 over their respective dials, which are graduated to indicate the desired electrical measurements. From the rear of this case projects a shaft 3, at the end of which is a small driving-wheel 4, adapted to gear with a crown-wheel 5. The wheel 5 is mounted on a sleeve 6, which carries a second similar wheel 7, the teeth of which are also on the lower side, and which sleeve is adapted to move up and down on the shaft 8.

9 is a clockwork or motor mechanism adapted to be wound by means of the spindle 10 and having any suitable regulating mechanism 11. The gearing and construction of this motor are not shown in full, since any suitable motor mechanism may be employed. The motor drives the spindle 8 at a constant speed, which is preferably such as to give the crown-wheels 5 7 two and one-quarter revolutions per hour. This gives said wheels one-quarter revolution for every six minutes. The sleeve 6 is provided with a cross-arm 12 and pins engaging with the spring 13, secured to the spindle 8 and forming a yielding driving connection therewith. Pivoted at 14 are two angle-levers 15 16, one end of each of which terminates between the crown-wheels 5 7 and the opposite ends of which terminate adjacent to the double-cam device 17. Said device consists of a wheel having, preferably, fifteen cam-teeth 18 and notches or depressions 19 around its periphery and a flange 20 on its lower side, said flange having fifteen corresponding but opposite teeth and depressions 21 22 on its inner side, as indicated in Fig. 2. This cam device is mounted on the shaft 23, which is driven at a regular speed, preferably making one revolution in three hours, by the motor. This cam device will therefore operate the levers 15 16 five times an hour. The lever 15 has a comparatively strong retracting-spring 24, tending to pull the lever in such direction as to move it to raise the crown-wheel 5 out of engagement with wheel 4. The angle-lever 16 has a weaker spring 25, tending to move its lever in the direction to bring said crown-wheel 5 into engagement with wheel 4.

26 is a detent-lever pivoted at 27 and having a suitable spring 28 for pressing it forward. This lever is provided with a projecting tooth 28′, adapted to snap over the lever 15 when it is in its lowest position—that is, in the position which it occupies when the wheels 4 5 are in engagement to hold said lever down.

29 is a large permanent magnet, between the poles of which is a coil 30, freely suspended in a manner well understood in the

construction of deflecting galvanometers and similar instruments, through which coil, which is in a shunt around the main-circuit low-resistance coil 31, the current to be measured is passed. This coil as it is rotated in the field of the magnet by the current moves a hand or pointer 32 toward the left against the tension of a light spring 33. This movement takes place when the crown-wheels 5 7 are in their highest position, so that the teeth of wheel 7 are out of contact with the tooth or extension 34, carried by the pointer. Hence said pointer is free to move. The outer end of the pointer normally rests immediately in front of the detent-lever 26.

When this meter is in use, the wheels 5 7 and the cam device 17 are constantly and regularly in motion, as already described. As the cam device moves forward, supposing the wheels 4 5 to be out of engagement, the lever 16 is moved toward the right, putting its spring under increased tension until the first tooth 21 passes from under the lever, when the spring 25 moves the lever forward, carrying the wheel 5 into engagement with wheel 4. At the same time that lever 16 is moved, as just described, by its cam lever 15 is moved in the opposite direction by its cam, putting its heavier spring under increased tension. If it were not for this movement, it is evident that the lever 16 could not move wheel 5 forward. As lever 15 is thus moved forward the tooth 28 of the pivoted detent-lever 26 will snap over it and hold it down. With the parts in this condition the driving-wheel 4 of the recording device will be rotated until the parts are moved back to their original position. As already indicated, the pointer 32 is engaged by the crown-wheel 7 through the tooth 34 when wheels 4 5 are in engagement, and it will be evident that the strength of the current in the coil at any particular time when the pointer is free to move will determine the distance from the detent-lever 26 which the hand will occupy and hence the length of time required for the wheel 7 to move the hand 32 toward the right far enough to strike the lower end of lever 26 and move it back slightly to release the lever 15, allowing its spring to raise the wheels 5 7, thus stopping the recorder. The wheel 5 will be thrown into engagement with wheel 4 at regular intervals whether any current is being used on the line or not; but in the latter case the recorder will not be advanced, since the hand 32 will move the detent-lever back before the yielding driving connection formed by the spring 13 and arm 12 transmits motion to the recorder driving-wheel 4.

It will be evident that lever 26 and the hand 32 form a trip or disengaging device, the operation of which is controlled by the force to be recorded, which in the apparatus above described is the electric current; but the position of the hand 32 can be controlled equally well by other currents or forces without departing from our invention. It is only necessary to mount said hand so that its position at any moment corresponds to said current or force.

We do not confine ourselves to the precise arrangement of levers, cams, &c., above specified, since it is evident that they may be largely varied without departing from our invention. It is essential, however, that the cams should operate on the controlling-levers for the gear-wheels in such manner as to increase the tension of their retracting-springs, so that when released they shall operate in substantially the manner above indicated.

What we claim is—

1. The combination, in a meter, of a recording device, a motor, intermediate driving connections, a pivoted lever having a retracting-spring for moving said driving connection out of engagement, a regularly-moving cam controlling said lever, and a trip or disengaging device controlled by the force being recorded, substantially as described.

2. The combination, in an electric meter, of a recording device, a regulated motor for advancing said recording device when in engagement, means for throwing the same into engagement at regular intervals, comprising suitable levers, springs adapted to move said levers forward, and regularly-moving cams for putting said springs under tension and then releasing them, and a trip or disengaging device controlled by the current being recorded, substantially as described.

3. The combination, in a meter, of a recording device, a wheel for advancing it, a rotating wheel movable into and out of gear therewith, means for moving said wheels into engagement at regular intervals, a hand or pointer normally free to move, a coil to the axis of which said pointer is connected and through which the current to be measured flows, and means for engaging said pointer when the wheel is engaged and moving it, means for moving said wheels out of engagement, and a detent in position to detain said means from operating, said detent being disengaged at the proper moment by means of said hand or pointer, substantially as described.

4. The combination of a recording device, a regulated motor for advancing it when in engagement, a wheel driven by the motor and movable into and out of gear with the driving-wheel of the recorder, spring-operated levers for moving the first-mentioned wheel, regularly-moving cams driven by the motor and in position to act on said levers to put their springs under tension and then to release them, and a trip or disengaging device controlled by the current or force to be recorded, substantially as described.

5. The combination of the recorder driving-wheel, the wheel adapted to gear therewith, and means for engaging and disengaging the same, comprising two pivoted levers with operating-springs, one lever and spring being in position to move the wheel in one direction, the other lever and spring being in position to move the wheel in the opposite direction, and

the operating-cams, and a trip or disengaging device controlled by the current or force to be recorded, substantially as decribed.

6. The combination, in an electric meter, of the recorder driving-wheel, the wheel adapted to gear therewith, and means for engaging and disengaging the same, comprising two pivoted levers with operating-springs, one lever and spring being in position to move the wheel in one direction and the other lever and spring being in position to move the wheel in the opposite direction, the operating-cams, a detent for holding the disengaging lever and spring from operation, and a detent the operation of which is dependent on the current being measured, substantially as described.

7. The combination, in an electrical meter, with a driven wheel of a recorder, of two crown-wheels, one of which is a driving-wheel adapted to gear with the driven wheel of the recorder, two pivoted levers terminating adjacent to said wheels, one acting against the same in one direction and the other in the opposite direction, springs connected to said levers, cams acting on the levers, and a trip or disengaging device controlled by the current being recorded, substantially as described.

8. The combination, in a meter, of a coil, an arm or pointer moved thereby, a recording device, a regulated motor adapted to drive the recording device when connected thereto, a movable gear driven by the motor, means comprising pivoted levers with springs of different strength, and cams operating thereon for moving said wheel into or out of engagement, substantially as described.

This specification signed and witnessed this 23d day of November, 1891.

JOHN F. OTT.
ARTHUR E. KENNELLY.

Witnesses:
JOHN F. RANDOLPH,
HARRY F. MILLER.