(No Model.) 2 Sheets—Sheet 1.

J. R. GROVE.

ELECTRIC METER.

No. 343,450. Patented June 8, 1886.

Fig. 1.

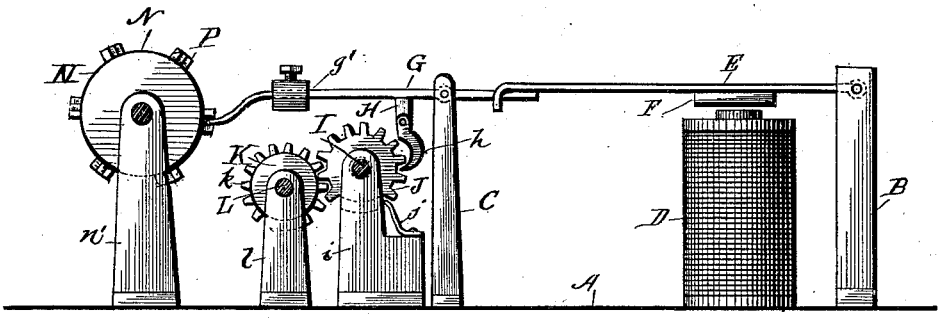

Fig. 2.

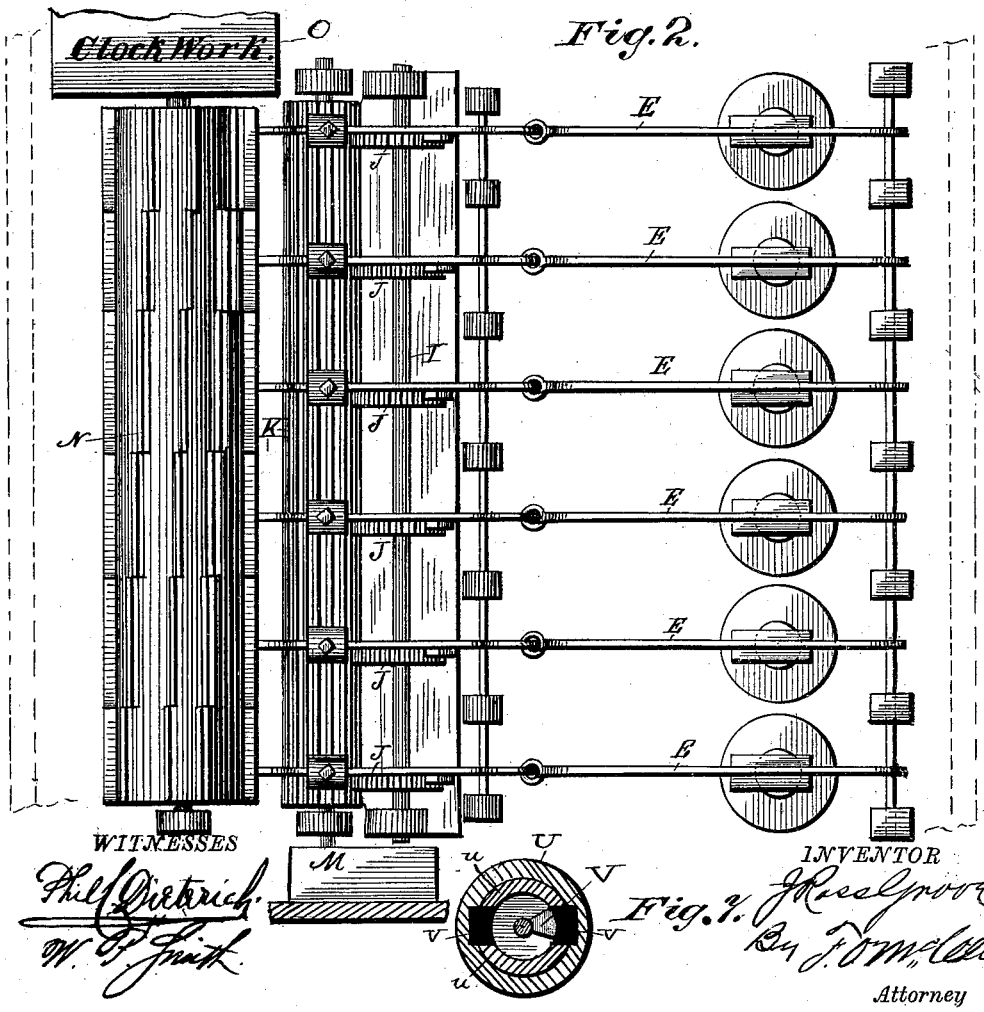

Fig. 3.

WITNESSES

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Fig. 3.

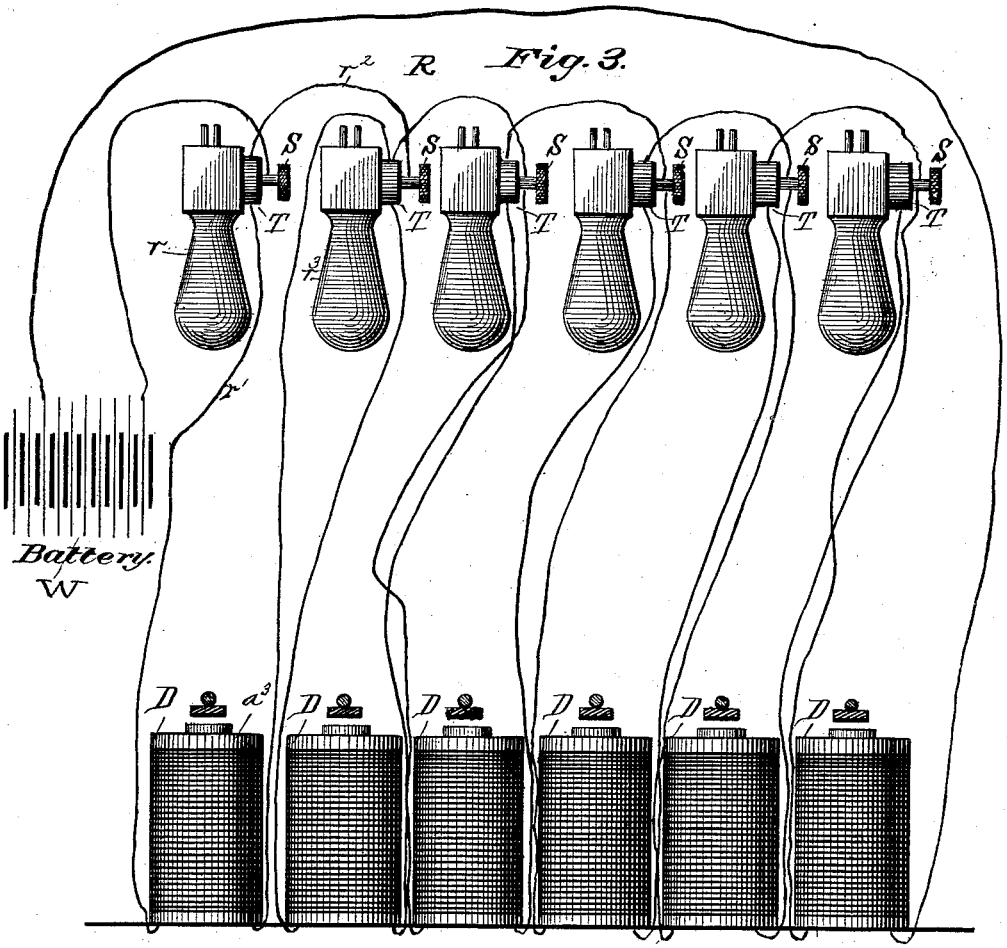
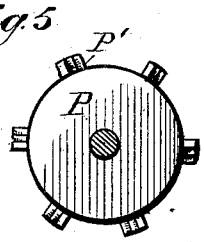


Fig. 4.

Fig. 5



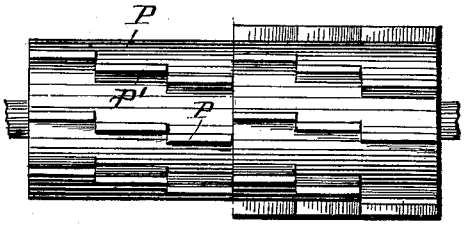


Fig. 6.

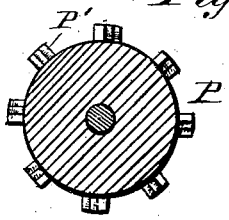
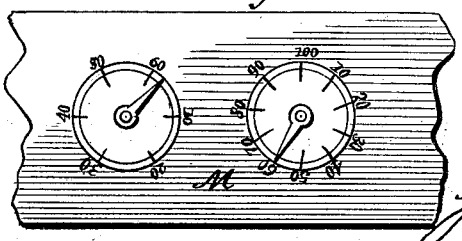


Fig. 8.



WITNESSES

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UNITED STATES PATENT OFFICE.

J. ROSS GROVE, OF YORK, PENNSYLVANIA.

ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No 343,450, dated June 8, 1886.

Application filed June 23, 1885. Serial No. 169,530. (No model.)

To all whom it may concern:

Be it known that I, J. ROSS GROVE, of York, in the county of York and State of Pennsylvania, have invented certain new and useful Improvements in Electric Meters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to electric meters, the object being to provide an improved means for registering the length of time in "current-unit hours" that an electrical current has been used.

Heretofore the registering apparatus of electric meters has been operated by the current to be measured, thus detracting more or less from the working current.

My invention aims to avoid the use of any part of the current whose time of use is to be measured for operating the registering apparatus, and, further, to so construct the registering apparatus as to lightness and simplicity that a strong current will not be required to operate it.

I am aware that heretofore electric lamps have been connected separately to electric meters; but such separate connections permit one or more lighted lamps of a series to be disconnected from the meter without interfering with the registering of the current from the connected lamps and without interfering with the operation of the disconnected lamp, thus allowing one or more lamps of a group to be disconnected from the meter while lighted without attracting notice, and thus the meter, while apparently registering correctly, is registering for only a part of the lamps of the group.

A further object of my invention is to connect the meter to a group or system of lamps serially, so that in case the connection between any one of the lighted lamps and the meter is broken the meter will cease operation entirely, thus indicating the defect.

A further object of the invention is to start and stop the registering apparatus by the lamp-keys, so that the registering apparatus will register as long as the lamps are lighted.

The invention consists in the combination, with an electric light or other device to be operated by the current whose time of use is to be measured, of a registering apparatus operated by a current independent of the aforesaid current.

The invention further consists in the various features of construction and combination of parts hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 represents a front elevation of my improved registering mechanism with its dials removed. Fig. 2 is a plan view of the same with the dial-casing added. Fig. 3 is a side elevation. Figs. 4, 5, and 6 are detail views representing different forms of the registering-drum. Fig. 7 is a sectional view of an improved switch-box employed in carrying out my invention, and Fig. 8 is a front view of the casing of the registering mechanism with the indicating-dials in view.

A represents a base upon which the various parts of the meter are supported. Upon this base A are secured posts B and C.

D represents an electro-magnet, supported upon the base adjacent to the post B.

E represents an armature lever, preferably made of wire and fulcrumed upon the post B, as shown.

F represents a piece of iron secured to the lever E above the magnet to be attracted thereby. The free end of the armature-lever E is of any form to receive one end of a lever, G, which is fulcrumed upon the post C. The free end *g* of the lever G is bent slightly, and said lever is provided with an adjustable weight, *g'*.

H represents an arm or lug depending from the lever G and provided with a pivoted hook, *h*, whose movement is limited. Adjacent to the hook *h* and below the lever G is arranged a shaft, I, held rigidly in bracket-bearings *i*, secured upon the base A. Upon this shaft is loosely mounted a cog-wheel, J, adapted to be engaged by the hook *h*, and provided with a guard-spring, *j*, to prevent back movement of the wheel.

K represents a revolving drum provided with longitudinal peripheral ribs or cogs *k*, extending throughout the length of the drum. This drum K is mounted rigidly upon a shaft, L, supported in bracket-bearings *l*, secured to the base A, and serving to operate the dial mechanism *m*.

N represents a continuously-rotating drum

mounted rigidly upon a shaft, *n*, which is supported in bracket-bearings *n'*, secured to the base A, and provided at one end with clock-work mechanism *o*. This drum N is provided with a series of projecting ribs, P, each of said ribs being bent at regular intervals at right angles, so that no two horizontal portions, P', of any one rib or of any two ribs will be in the same horizontal plane.

The foregoing description covers one complete set of registering appliances which is capable of use (when proper electric connections are made) for indicating upon the dials the time a given current has been used; but inasmuch as it is designed to employ a group or series of several independent appliances, as above described, together, the operation of the parts will now be explained with reference to Figs. 2 and 3, which illustrate a series of the registering devices arranged together.

In Fig. 3, R represents a group of incandescent electric lamps, each provided with a key, S, and a switch-box, T, through which the key passes. The box T is seen in section in Fig. 7.

U represents the box or casing, of circular form and containing two oppositely-arranged semicircular contact plates, *u u*, separated by insulation, as shown at *v v*. The inner end of the stem *s* of the key S carries a triangular piece of metal, V, which serves to electrically separately connect the points *u u* with the key.

In Fig. 3, W represents a battery, one of whose wires passes to the key stem of the first lamp, *r*. A second wire, *r'*, connects one of the points *v* of the first switch-box with the first magnet, a^3. A third wire, r^2, connects the other point *v* of the first switch-box with the key of the second lamp, r^3, which key is connected to the first magnet, as shown. Similar connections are made between the other lamps and magnets, so that the current from the battery passes first to the key of the first lamp, from thence through one of the points *v* to the magnet, if the lamp is burning. If, however, the first lamp is not burning, the current passes from the key to the upper contact-point of the first switch-box, and from thence to the key of the second lamp. If the latter is burning, the current will pass to the second magnet, to operate the registering devices corresponding to said second magnet, and so on. Thus it will be understood that unless the lamp is burning the magnet corresponding thereto will not receive the current, and will therefore not operate the registering devices controlled by said magnet. It will also be understood that if the lamps (or any of them) are lighted the corresponding magnets will be energized to operate the registering devices. Thus a perfectly-accurate register is obtained of the time during which the current is used. The current passing through the magnet D, Fig. 1, draws down the armature-lever E by the attraction of the iron piece F. The depression of the armature-lever E raises the curved end of the lever G, so that the latter will be engaged by the adjacent projection on the drum N, thus depressing the lever G, and causing the hook or pawl *h* to turn the cog-wheel J tooth by tooth, said cog-wheel J in turn operating the drum K, and through it the dials. As soon as the current is shut off from the magnet D, the weight *g'* of the lever G will overbalance the armature-lever E, thus slightly lowering the hooked end of the lever G, so that it will not be struck by the projections of the drum N, and also dropping the pawl *h* out of contact with the wheel J.

The object of arranging the horizontal portions P' of the ribs P of the drum N in different horizontal planes is to prevent any two levers G being struck by said ridges at the same time. In other words, the arrangement of said ribs is such that each registering-lever will be operated upon separately to impart an independent and distinct movement to the drum K.

As shown in Fig. 4, the drum N may be divided to accommodate lamps of different candle-powers. For example, the section of the drum for a twelve-candle-power light would have, say, six ridges or ribs to make one revolution in an hour, thereby causing each armature to register once every ten minutes. Upon a section of the same drum may be arranged eight ridges or ribs for a sixteen-candle-power lamp, thus causing each armature of the registering device of said lamps to register once every seven and one-half minutes. This arrangement of the drum is made for the reason that the charge for sixteen-candle-power lamps is proportionately greater than for lamps of twelve-candle power; hence it is necessary to register oftener for the sixteen-candle-power lamps, so that the computation of charges may be increased.

It will be apparent that the arrangement of projections on the drums may be thus varied to suit lamps of all different candle-powers.

I take as the unit of registration, say, a sixteen-candle-power lamp for one hour, and call it one "current-unit hour." It will be apparent that an eight-candle-power lamp for two hours, or a four-candle-power lamp for four hours, will equal one current-unit hour, and so on.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the devices to be operated by the current whose time of use is to be measured, of a registering apparatus, clock-work mechanism, and electrical devices operated by an independent current, substantially as described.

2. The combination, with an electric lamp, of an electric meter operated by clock-work and by a current independent of the lamp-current, and a circuit-breaker connected with the key of the lamp, to control the independent current, substantially as described.

3. The combination, with an electric meter for registering the time of use of a current, of

a battery for supplying an independent current to said meter, substantially as described.

4. The combination, with a series or group of electric lamps, of an electric meter controlled by a current independent of the lamp-current, said meter consisting of a series of independent registering devices connected serially with the keys of said lamps, so that if the connection between any one key and the meter is broken the meter will not register for any of the lamps, substantially as described.

5. The combination, with a series of electric lamps, of an electric meter controlled by an independent battery-current, and consisting of a drum provided with clock-work mechanism, a series of electrical registering devices corresponding in number to the lamps, and connected serially to said lamps, so that all are in one circuit, substantially as described.

6. The combination, with the key of an electric lamp, of a registering apparatus electrically connected to said key, and controlled thereby to register when the key is turned to light the lamp, and to continue registering as long as the lamp is burning, and to cease registering when the key is turned to extinguish the lamp, substantially as described.

7. The combination, with electric lamps of different candle-powers, of an electric meter having a drum rotated by clock-work, a series of registering devices controlled by a current of electricity, and a series of projections arranged upon said drum at varying intervals, to operate the registering devices of the lamps of high candle-power oftener than those of lower candle-power, substantially as described.

8. The combination, with the devices to be operated by the current whose time of use is to be measured, of a registering apparatus consisting of a pivoted armature and a magnet, a lever provided with a weight, a pawl or detent, and a catch-finger, a revolving drum operated by clock-work, a registering-drum, and a cog-wheel, substantially as described.

9. In an electrical meter, the combination, with a drum provided with ribs, as described, and operated by clock-work, of a registering-drum and dials, a cog-wheel meshing with said registering-drum, a weighted lever, a pivoted armature, and an electro-magnet receiving its current from a battery or other source independent of the current whose time of use is to be determined, substantially as described.

10. The combination, with the meter, of a battery and clock-work mechanism for operating said meter, and an electric lamp whose key is connected into the circuit from said battery, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

J. ROSS GROVE.

Witnesses:
F. O. McCLEARY,
WM. H. BATES.