

(No Model.)

2 Sheets—Sheet 1.

E. HARTMANN.  
ELECTRIC METER.

No. 523,662.

Patented July 31, 1894.

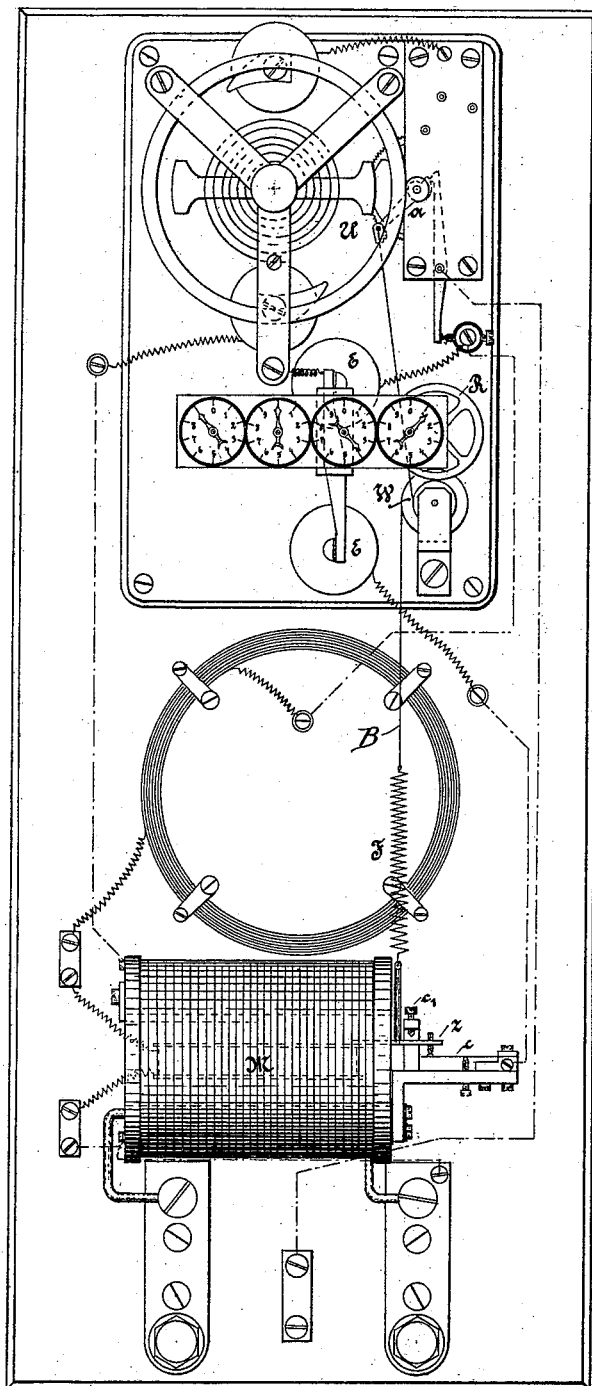


Fig. 1.

Witnesses:  
W. C. Pinckney  
M. A. Cunningham.

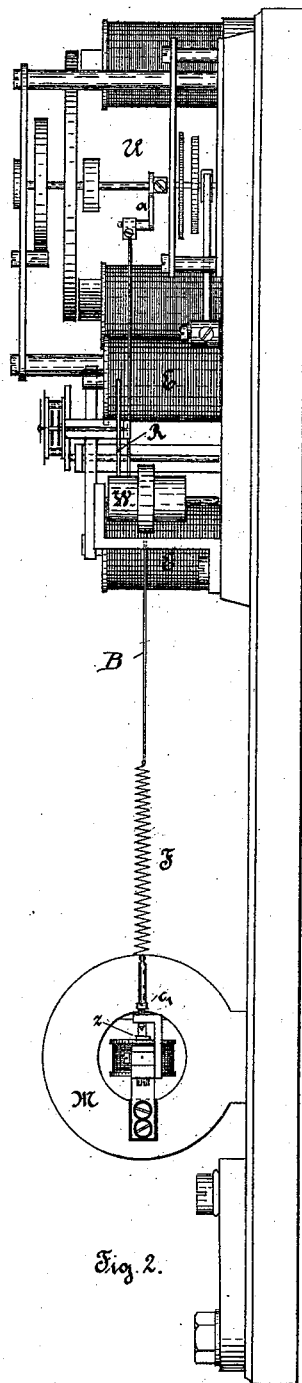


Fig. 2.

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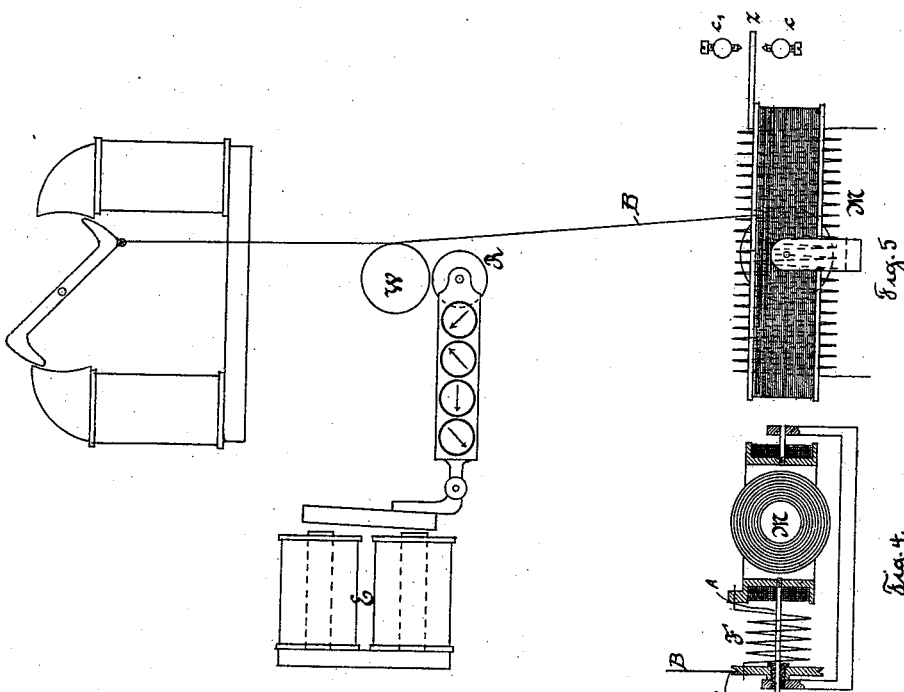
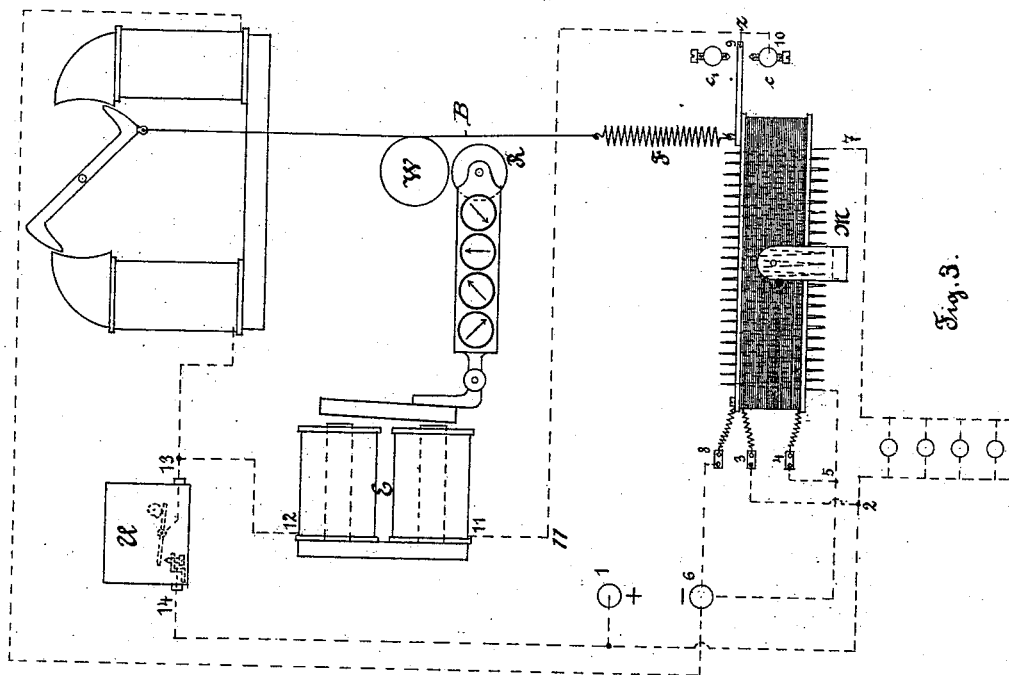
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# UNITED STATES PATENT OFFICE.

EUGEN HARTMANN, OF FRANKFORT-ON-THE-MAIN, ASSIGNOR TO HARTMANN & BRAUN, OF BOCKENHEIM, NEAR FRANKFORT-ON-THE-MAIN, GERMANY.

## ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 523,662, dated July 31, 1894.

Application filed March 23, 1893. Serial No. 467,262. (No model.)

*To all whom it may concern:*

Be it known that I, EUGEN HARTMANN, a subject of the German Emperor, resident at Frankfort-on-the-Main, Germany, (assignor to the firm of HARTMANN & BRAUN, of Bockenheim,) have invented new and useful Improvements in Electric Meters, of which the following is a specification.

This invention relates to an electric meter for continuous and alternate currents wherein the indications of a watt-meter are transmitted at certain intervals to counting mechanism.

In the accompanying drawings forming part of this specification Figure 1 is a front elevation of an electric meter embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a diagrammatic illustration of my invention as shown in Figs. 1 and 2. Fig. 4 is a diagrammatic illustration corresponding with that shown in Fig. 3 but with the various electrical circuits omitted and showing a variation with reference to the spring employed in combination with the watt meter. Fig. 5 shows a side view of such watt meter and spring.

Corresponding letters and figures of reference throughout the different views refer to corresponding parts.

The following is a description of the apparatus as illustrated in Figs. 1, 2, and 3.

M is the watt-meter of a well known form through the thick stationary coils of which the current used in the main circuit flows while the thin movable coils are situated in a shunt to the main circuit. An arm Z is fixed on the movable bobbin of the watt-meter in order that the motion of said bobbin may be confined within narrow limits by screws *c* and *c'*, and the circuit of the electromagnet E interrupted or closed. The direction of current in the watt-meter is such that the force resulting from the action of the current tends to press the arm Z of the movable bobbin against the screw *c*. The electric energy to be measured is in this watt-meter determined by the extent to which the spring F attached to the arm Z must be expanded, until the arm just quits the screw *c* and swings freely between *c* and *c'*. In order that a reg-

istration of the watt-meter indications, or of the extent of the corresponding spring expansions, may be obtained, the spring F is expanded by means of a clockwork U or by an electromagnet acting under the control of clockwork once in every minute to a maximum point and then released. A cord B for such purpose connects the spring with said electro magnet. A roller W is at same time revolved, and the clockwork is provided with a contact which closes the circuit of the electromagnet E only so long as the spring is being expanded. As long as the circuit of the electromagnet E is closed and the current flows through it the first wheel R of the counter mechanism, which is carried by the armature of the electromagnet E, is pressed against the roller W with which it remains in contact so long as the electromagnet is excited.

The path of the current in the several parts of the electric meter is as follows:

Thick coils. From terminal 1 to 2 through the main circuit 1 to 7 through the thick coils to terminal 6.

Thin coils. From terminal 1 to 2, 3, through the thin coils to 4, 5, and terminal 6.

Electromagnet E. From terminal 1 to 14 through the contact lever of the clockwork to 13, 12, through the coils of the electromagnet E to 11, 10, through the contact *c* to arm Z, through the body of the movable bobbin to 8, and thence to terminal 6.

The operation of counting is as follows:— By the use of the current the arm Z is pressed with a certain force upon *c*. The spring F can then be expanded by the clockwork or the electromagnet and the contact in the clockwork being closed and arm Z in contact with *c* the electromagnet E is excited and R is pressed against roller W which is forced to turn with the pull on the spring F and performs a to and fro movement proportional to that of the spring. Directly spring F is so far expanded that its power balances that of the watt-meter the arm Z quits the contact *c* the electromagnet circuit is thereby interrupted and R quits the roller W. A rotatory motion is therefore imparted to the wheel R proportional to the current action of the watt-meter. The more electrical energy there is

used the longer Z remains upon c, because spring F must be so much more expanded until equilibrium ensues, and for so much longer the electromagnet E remains excited, therefore the wheel R, which is the first member of an ordinary counting train, is turned to such a greater extent. At every inward motion of the lever arm of the clock-work U, by which the spring is expanded, the electromagnet circuit is interrupted at the contact lever, or if for the continuous to and fro motion of the spring, a special electromagnet be employed, as shown in the drawings, its circuit will be periodically closed by the contact of the clockwork.

In the apparatus illustrated in Figs. 4 and 5 a spring F' is employed torsionally. In that case this spring is made to act upon and is connected with and placed around the axis A of the movable bobbin of the watt meter, the other end being attached to a pulley P. Around the periphery of such pulley passes the cord B so as to convert movement of the clock-work into revolving motion of the pulley. The spring is thereby put under torsional strain until the limit is reached, when the arm Z becomes separated from contact C.

In order to render the indications of the electric meter dependent on the amount of current used only, the movable bobbin of the watt-meter, can be replaced in the known way by a permanent magnet arranged movably in the same manner, in which case the meter will be a coulomb counter for continuous current. Moreover the permanent magnet may be so attached that the thick coils traversed by the current exert thereon an attractive or drawing in action by which means the axis upon which the movable bobbin is pivoted may be dispensed with, the magnet being directly hung upon the spring F. In this case the screws c c' so retain the magnet that proportionality is maintained between the current strength and the corresponding expansion of the spring. The coupling of the counter mechanism with the spring may also be effected through the electromagnet by pressing the roller W against the counter mechanism. The counter mechanism may be pressed directly against the tension band of the spring by the electromagnet for the purpose of transmitting the motion by friction.

The clock work may be of the ordinary kind driven by a spring or weight or by electrical power.

It is a peculiarity of my apparatus that the arm Z to which F is connected is normally held at rest in contact with point c by the action of the electric current and is only detached therefrom after spring F has become

sufficiently expanded that its power balances that of the watt meter.

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

1. An electric meter comprising a watt meter, an arm held against a contact by the force of the watt meter, clock-work mechanism, a connection between the same and the arm actuated at intervals by such mechanism, whereby the arm becomes detached from the contact, a spring forming part of such connection, and counting mechanism adjusted to be operated by such connection at a point between the spring and the clock-work, substantially as set forth.

2. An electric meter comprising a watt meter, an arm held against a contact by the force of the watt meter, clock-work mechanism, a connection between the same and the arm actuated at intervals by such mechanism, whereby the arm becomes detached from the contact, a spring forming part of such connection, and counting mechanism adjusted to be operated by such connection at a point between the spring and the clock-work, an electromagnet for energizing the counting mechanism and a circuit normally closed by such arm and said contact and connected with such electro-magnet, substantially as set forth.

3. In an electric meter, the combination with a watt meter, a spring attached to an arm extending from the meter, contact point c, electro-magnet E, clockwork U for intermittently expanding such spring, counter mechanism containing wheel R and carried by the armature of such electro-magnet, and roller W, substantially as described.

4. In an electric meter, the combination of a watt meter, a coiled spring F having one end attached to an arm extending from the meter and having its other end connected with a band attached to the periphery of a roller W, contact points c and c', electro-magnet E, clockwork U for intermittently expanding the spring, counter work carried by the armature of the electro-magnet and having part of its mechanism adjusted in proximity to roller W, whereby upon the closing of the circuit of electro-magnet E such part of the counter work will be brought in operative contact with roller W, substantially as described.

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

EUGEN HARTMANN.

Witnesses:

WUNIBALD BRAUN,  
F. C. FOHLE.