No. 631,343. Patented Aug. 22, 1899.

E. THOMSON.

SYSTEM OF ELECTRIC METERING.

(Application filed Mar. 21, 1898.)

(No Model.)

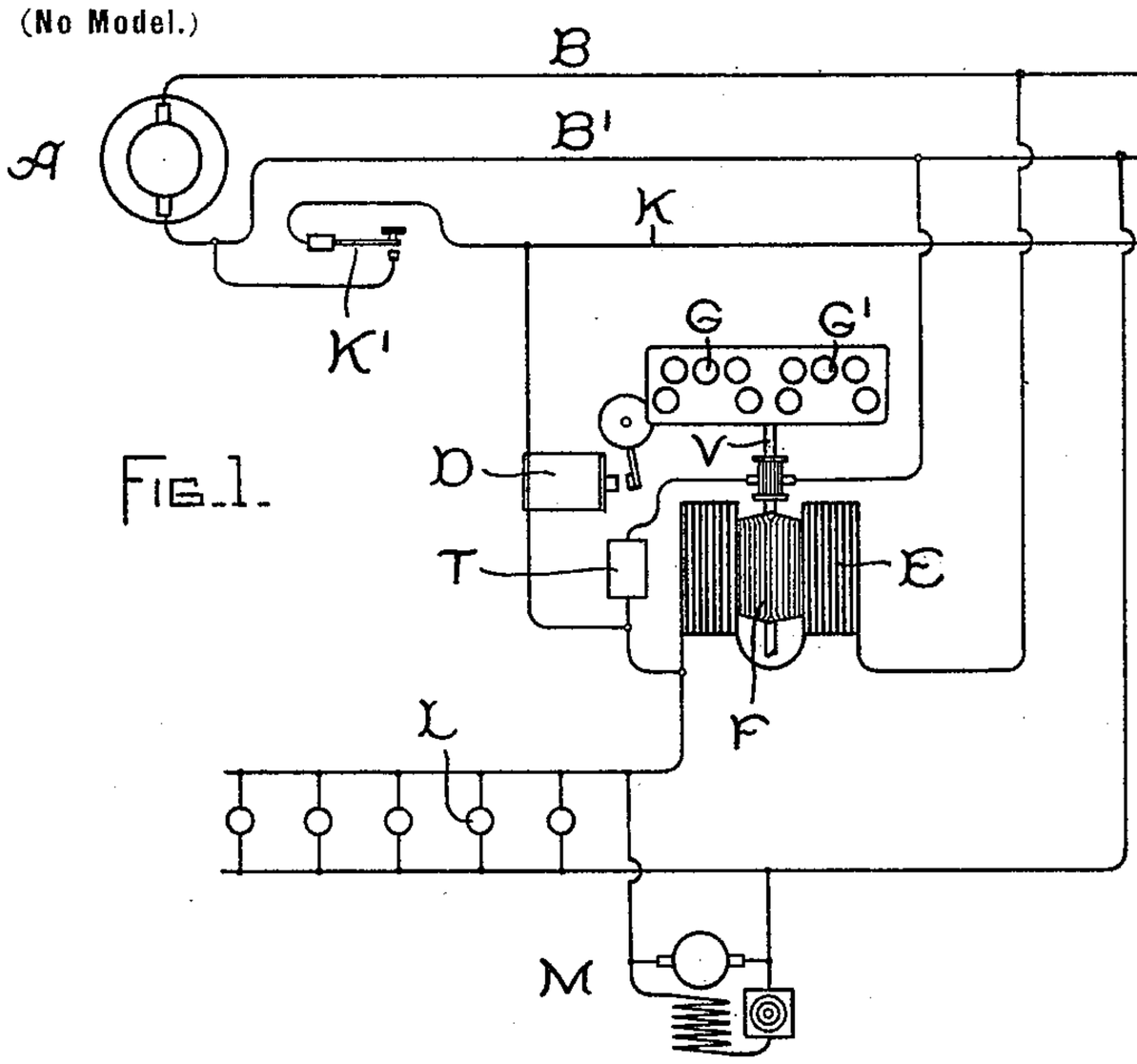


FIG. 1.

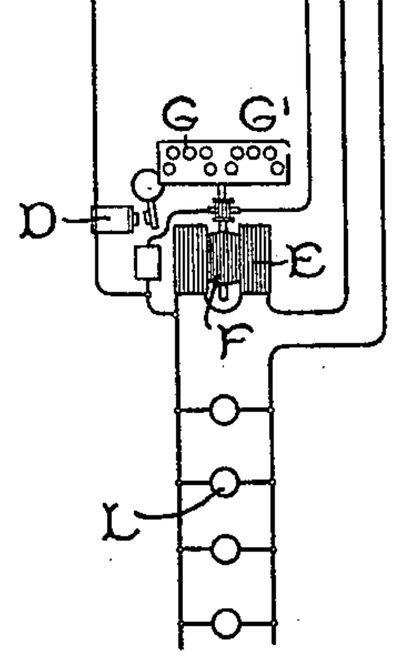


FIG. 2.

FIG. 3.

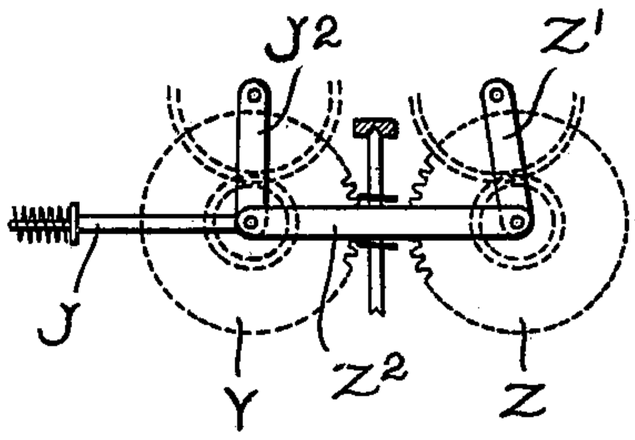
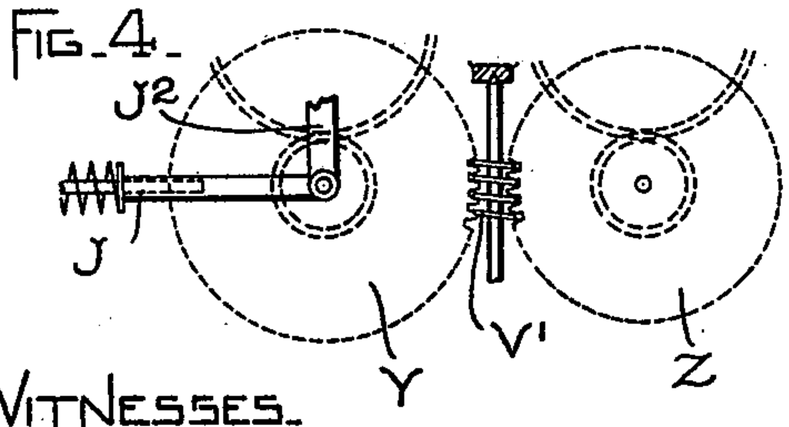


FIG. 4.



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UNITED STATES PATENT OFFICE.

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SYSTEM OF ELECTRIC METERING.

SPECIFICATION forming part of Letters Patent No. 631,343, dated August 22, 1899.

Application filed March 21, 1898. Serial No. 674,605. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Systems of Electric Metering, (Case No. 702,) of which the following is a specification.

My invention relates to systems of electric metering in which the meters are so arranged that their rate of registration may be changed independent of load changes on the particular circuit to which they are connected, so that a discount may be given to the consumers during certain periods of the day to induce them to use current at that time. This discount is preferably given at the time the load on the central station is light; but it may be given at any desired time.

My invention has for its object to arrange the meters and their connections in such manner that the rate at which the meters register may be controlled independently of the speed of the motor mechanism from any suitable distant point—as, for example, a station or substation.

In the accompanying drawings, Figure 1 illustrates in diagram a system of distribution embodying my invention. Figs. 2 and 3 are enlarged details of the means employed to shift the registering mechanism, and Fig. 4 is a detail of the gearing of the registering mechanism.

In Fig. 1, A represents a generator or other source of power, and extending therefrom are mains B B′. As a matter of convenience my invention is shown in connection with a direct-current two-wire system; but it is equally applicable to alternating-current systems or to three-wire systems, either continuous or alternating. Extending from mains B B′ are branch mains which supply current to non-inductive translating devices L or inductive translating devices, as indicated by motor M. Each pair of branch mains is provided with a meter, which is connected in circuit in such manner that it will register the energy consumed by the translating devices. In addition to the circuit-mains a normally idle wire K extends from the station where the source of supply is located or from a substation, as desired, to one or more of the meters employed on the system. By means of this wire the rate of registration of the meter is controlled independently of the energy consumed in a given circuit without changing the rate at which the meter mechanism moves. The wire K is connected in circuit with the source of supply by switch K′. In the present instance current is received from generator A; but a separate source of energy may be employed, if desired.

In carrying out my invention any suitable form of motor-meter may be employed. In the present instance I have shown a type of motor-meter having field-coils E, which are included in circuit with one or more of the mains, and an armature F, connected across the mains and revolving within the influence of the field-coils. To limit the current flowing through the armature, a resistance T is employed. While no form of damping mechanism constituting a load for the meter is shown, it is to be understood that such an arrangement is employed. Instead of the customary single dial for recording the consumption of energy I have shown a double dial G G′, with suitable mechanism for connecting the gearing with the worm V′, which is formed on the upper end of the armature-shaft V.

In Fig. 2 is shown an enlarged detail view of the mechanism employed to connect and disconnect the gearing of dial G′ with the worm V′. Each dial is provided with a suitable train of gears and indicators or hands *g*. On the upper end of the armature-shaft V is a worm V′, which meshes with worm-wheel Z in the normal operation of the meter and registers the number of revolutions or movements of the armature. Discount-dial G is disconnected from worm V′, except at such times as it is desired to give a discount to the customer and record the energy consumed at that time on a separate dial. With this arrangement the dial G′ records continuously and indicates the total consumption of energy in the circuit, and dial G records intermittently. To control the operation of dial G, a magnet D is employed, the winding of which is connected at one end to wire K and to a circuit-main at the other. Mounted for rotary movement on shaft H is a disk H′, hav-

ing a cam-groove H^2 near its outer periphery. Rigidly secured to shaft H is a ratchet H^3, and engaging therewith is a pawl I′, which is carried by lever I. Lever I is loosely mounted on shaft H and normally is retained in the position shown by spring I^2. When the magnet D is energized by closing the circuit of the wire K, the armature of lever I is attracted against the action of spring I^2. The pawl I′ engaging with the teeth of the ratchet advances disk H′ through a certain number of degrees. With the arrangement shown two impulses of current are necessary to advance the disk to a point where cam-roller J^3 will be in its extreme left-hand position and the worm-wheel Y out of mesh with the worm V′. By altering the relation of the parts—as, for example, making the throw of lever I greater or by changing the number and relation of waves in the cam-groove—a single impulse of current will suffice to move the worm-wheel Y into and out of engagement with worm V′, or by reducing the throw of the lever a greater number of impulses may be required to perform the necessary adjustment. The gearing of dial G is similar to that of G′, with the exception that worm-wheel Y instead of being rigidly mounted is carried by the lower end of arm J^2 and is moved into and out of engagement with the worm-wheel by the rod J. To compensate for slight irregularities and to insure the worm-wheel Y meshing with worm V′, the rod J is made in two parts, with a sliding spring connection between the parts.

In Fig. 3 is shown a slight modification, the object being to disconnect the main registry-dial G′ at the time the discount-dial is in operative connection with the meter. By this arrangement both dials become direct reading—that is to say, dial G′ will indicate the amount of energy to be paid for at full rate and dial G the amount for which discount is given. To accomplish this, worm-wheels Z and Y are both mounted on the lower ends of arms Z′ and J^2 and the two arms connected by links Z^2. Movement is imparted to the worm-wheels by the operating-rod J, as described in connection with Fig. 2. The arrangement of the parts is such that as one worm-wheel is withdrawn from mesh with worm V′ the other is moved into mesh.

In using double dials it is understood that the registers themselves may not differ, as the price charged for energy registered by the discount-dial can be different from that registered by the normal dial, or the gear-trains of the registers may be different and the same rate charged for the energy recorded by both dials. In this case the discount-dial should be so geared as to move more slowly than the normal dial. In Fig. 4 I have shown such an arrangement in which the gear Z of the main registry-dial is smaller than the gear-wheel Y of the discount-dial and is provided with a number of teeth—as one hundred and twenty, for example. The gear Y, being greater in diameter, is provided with a greater number of teeth—as one hundred and forty, for example.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electric metering system, the combination of one or more meters located at or near the translating devices, for regulating the amount of energy consumed, with a step-by-step means for changing the registration of the meter which is actuated by a number of current impulses controlled from a point distant from the meter.

2. In an electric metering system, the combination of a plurality of meters located at the various points of consumption, each meter being provided with a double dial, and a step-by-step mechanism controlled from the central or sub station, for shifting the dials of said meters when it is desired to give a discount to the consumer.

3. In an electric meter, the combination of a motor mechanism, comprising fixed and moving parts, two registering mechanisms mounted for operative connection with the moving part of the meter and arranged to record at different rates for a given flow in the meter, and a cam located at each meter and controlled from the station or substation, for throwing one of the registering mechanisms into operative connection with the moving part of the meter when it is desired to give a discount to the user.

4. In an electric metering system, the combination of one or more meters located at the points of consumption, each meter consisting of moving and stationary parts, and a rotating device controlled by a succession of current impulses sent out from the central or sub station, for changing the relation of the operative parts of the meter.

5. In a system of electric metering, the combination of one or more meters located at the various points of consumption, and connected in circuit in such manner that they register the consumption of energy, an auxiliary wire extending from the station or substation, and a cam located at each meter, which is controlled by a series of current impulses sent over the auxiliary wire, for changing the relation of the meter parts.

6. In an electric meter, the combination of a field-magnet, an armature rotating within the influence of the field-magnet, a double dial for registering the revolutions of the armature, each dial provided with a train of gears, a cam for moving one set of gears into and out of mesh with a worm on the moving armature, and a magnet for actuating the cam.

In witness whereof I have hereunto set my hand this 14th day of March, 1898.

ELIHU THOMSON.

Witnesses:
DUGALD MCKILLOP,
JOHN MCMANUS.