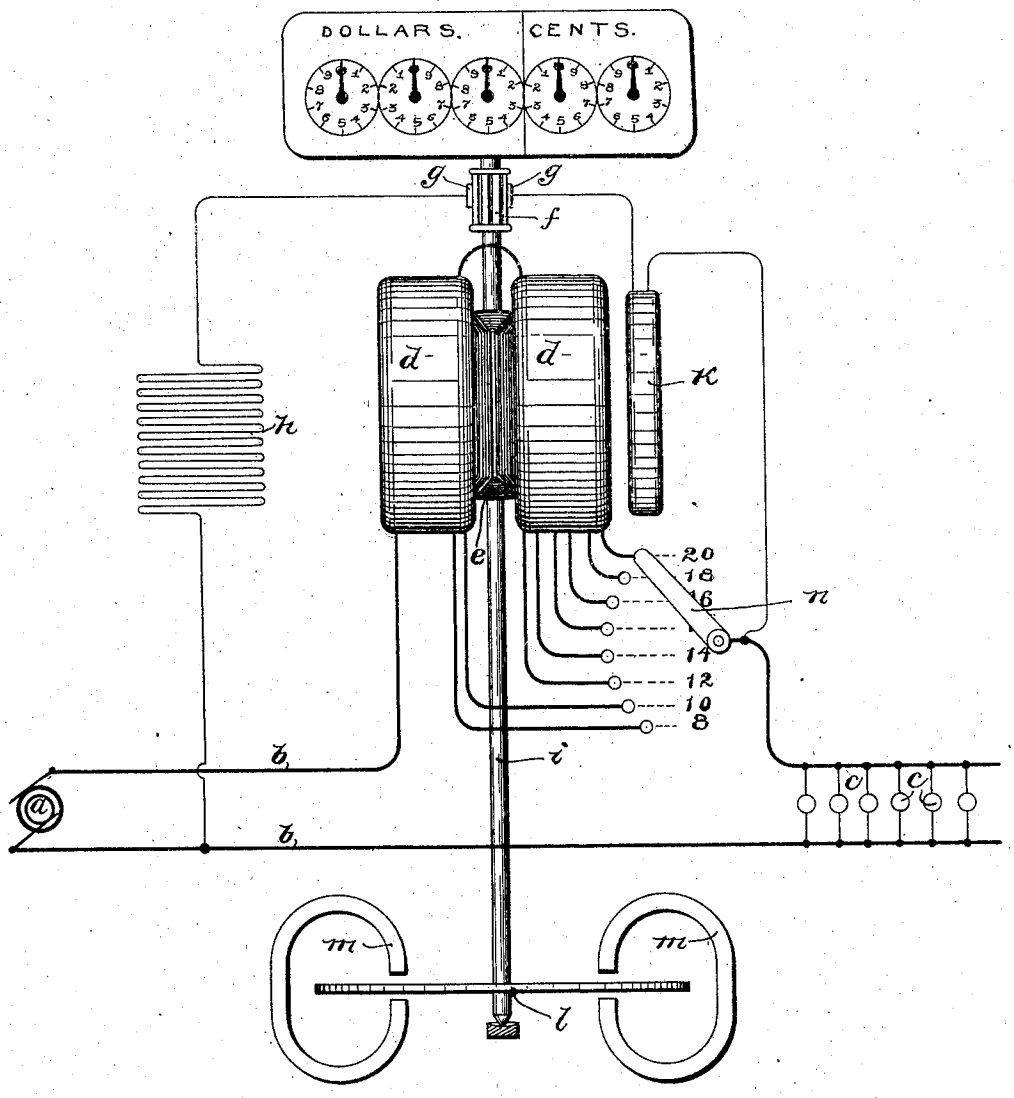
No. 796,034. PATENTED AUG. 1, 1905.

T. DUNCAN.

ELECTRIC METER.

APPLICATION FILED JULY 3, 1901.



Witnesses
Max W. Zabel.
Harvey L. Duncan.

Inventor
THOMAS DUNCAN

By Charles A. Brown Cragg & Delfield
Attorneys

ANDREW B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

THOMAS DUNCAN, OF CHICAGO, ILLINOIS.

ELECTRIC METER.

No. 796,034. Specification of Letters Patent. Patented Aug. 1, 1905.

Application filed July 3, 1901. Serial No. 66,951.

To all whom it may concern:

Be it known that I, THOMAS DUNCAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electric Meters, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to meters, and has for its object the provision of an improved form of meter whereby the consumer can ascertain without calculation and without special knowledge of the instrument the cost of his service.

In practicing my present invention I preferably employ a commutated motor-meter having current and pressure windings in combination with means for changing the effective number of turns of one of the windings, whereby the torque is adjusted to produce a speed of the meter in proportion to the cost of the current. I prefer to change the effective number of turns of the series winding, for which purpose a switching device having step-by-step contacts corresponding to different costs of current is employed, the various contacts constituting terminals of different parts of the winding, so that more or less of the current-winding is included in circuit, according to the position of the switch-arm.

I will explain my invention more fully by reference to the accompanying drawing, which illustrates a meter constructed in accordance with my invention.

I have shown an alternating-current generator *a*, supplying current to transmission-mains *b b*, that convey current to translating devices *c c*, which may be incandescent lamps, motors, or other instrumentalities. I do not wish, however, to be limited to an alternating-current system of distribution, as my invention is equally applicable to other systems of distribution. In the specific application of the invention illustrated the measuring instrument is in the form of a commutated alternating-current wattmeter provided with field-coils *d d* and an armature *e* in inductive relation therewith, the fields of the armature and field-coils being in phase when the current and pressure in the working circuit are in phase. The field-coils are in this instance in series with one of the mains *b*, while the armature is provided with a commutator *f*, which engages brushes *g g*, that are connected with the mains *b b* and which include the armature in bridge of the transmission-mains, a resistance *h* being included in the same bridge. Thus in accordance with the well-known practice the field-winding *d* and the armature *e* produce fields that are in proportion to the current and pressure, a torque resulting that causes a rotation of the shaft *i* in proportion to the watts. A starting-coil *k* is provided for overcoming friction, &c., while the shaft *i* is provided with a damping-disk *l*, that coöperates with the damping-magnets *m* to retard the rotation of the shaft.

As indicated in the drawing, the meter is adjusted for the highest price of current, (in this instance twenty cents,) the entire field-winding being included in the main circuit, whereby the greatest torque is secured and the shaft of the meter caused to rotate at the highest rate of speed. As the cost is reduced less of the current-winding should be included in circuit to reduce the torque. Thus if the cost is eighteen cents the switch *n* is move from the button "20 cents" to the button "18 cents," a section of the series winding being thus cut out of circuit.

I have not illustrated any of the counting mechanism in this application, the shaft of the meter being, as is understood, coupled with the counting-train to operate the index of units of cents upon the extreme right, the index of tens of cents next to the extreme right, the index of units of dollars to the left of the tens of cents, the index of tens of dollars to the left of units of dollars, and the index of hundreds of dollars to the left of tens of dollars.

While I have herein shown and particularly described the preferred embodiment of my invention, it is obvious that changes may readily be made without departing from the spirit thereof, and I do not, therefore, wish to be limited to the precise disclosure thereof herein set forth; but,

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

1. The combination with a system of electrical distribution, of a meter supplied with current therefrom, measuring mechanism provided with means for determining the monetary equivalent of the consumed current, step-by-step adjusting means for governing the effective quantity of field-winding of the meter to produce a torque in propor-

tion to the cost set for the current to produce a change in rotation of the rotating element of the meter in proportion to the current cost and thereby effect a corresponding operation of the measuring mechanism, and a torque coil or winding *k* subject to the pressure, substantially as described.

2. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the monetary equivalent of the consumed current, step-by-step adjusting means for adjusting the effective quantity of a field-winding to adjust the torque of the meter to produce a rotation of the rotating element of the meter and an operation of the measuring mechanism in proportion to the cost of a given quantity of current that may be set, and a torque coil or winding *k* subject to the pressure, substantially as described.

3. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the monetary equivalent of the consumed current, a step-by-step device to adjust the effective amount of one of the said windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, and a torque coil or winding *k* subject to the pressure, substantially as described.

4. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the monetary equivalent of the consumed current, a step-by-step device to adjust the effective amount of the current-windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, and a torque coil or winding *k* subject to the pressure, substantially as described.

5. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the monetary equivalent of the consumed current, a step-by-step device to adjust the effective amount of one of the said windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, a commutator for the armature of the said meter, and a torque coil or winding *k* subject to the pressure, substantially as described.

6. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the monetary equivalent of the consumed current, a step-by-step device to adjust the effective amount of the current-windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, a commutator for the armature of the said meter, and a torque coil or winding *k* subject to the pressure, substantially as described.

7. The combination with a system of electrical distribution, of a meter supplied with current therefrom, measuring mechanism for determining the quantity of the consumed current, step-by-step adjusting means for governing the effective quantity of field-winding of the meter to produce a torque in proportion to the cost set for the current to produce a change in rotation of the rotating element of the meter in proportion to the cost, and thereby effect a corresponding operation of the measuring mechanism, and a torque coil or winding *k* subject to the pressure, substantially as described.

8. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the quantity of the consumed current, step-by-step adjusting means for adjusting the effective quantity of field-winding to adjust the torque of the meter to produce a rotation of the rotating element of the meter and an operation of the measuring mechanism in proportion to the cost of a given quantity of current that may be set, and a torque coil or winding *k* subject to the pressure, substantially as described.

9. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism for determining the equivalent of the consumed current, a step-by-step device to adjust the effective amount of one of said windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, and a torque coil or winding *k* subject to the pressure, substantially as described.

10. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the quantity of the consumed current, a step-by-step device to adjust the effective amount of the current-windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, and a torque coil or winding *k* subject to the pressure, substantially as described.

11. The combination with a system of electrical distribution, of a meter having field-

windings receiving current from the said system, measuring mechanism provided with means for determining the quantity of the consumed current, a step-by-step device to adjust the effective amount of one of the said windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, a commutator for the armature of said meter, and a torque coil or winding *k* subject to the pressure, substantially as described.

12. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system, measuring mechanism provided with means for determining the amount of the consumed current, a step-by-step device to adjust the effective amount of the current-windings, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, a commutator for the armature of said meter, and a torque coil or winding *k* subject to the pressure, substantially as described.

13. The combination with a system of electrical distribution, of a meter having field-windings receiving current from the said system and setting up corresponding magnetic fields, measuring mechanism provided with means for determining the quantity of the consumed current, a step-by-step device to adjust the strength of one of said magnetic fields, thereby to govern the torque and adjust the speed of the meter in accordance with the cost set for a given amount of current, and a torque coil or winding *k* subject to the pressure, substantially as described.

14. The combination with a source of electrical energy, of mains supplied thereby and conveying current to translating-mains, a wattmeter having current and pressure windings supplied with current by the system step-by-step adjusting mechanism for determining the effective quantity of the current-windings, and a torque coil or winding *k* subject to the pressure, substantially as described.

15. The combination with a generator of electrical energy, of mains for supplying the said energy to translating-mains, a wattmeter having current and pressure windings, the current-windings being included in series in the working circuit, said windings being subdivided into coils, terminal contacts for the coils and the switching-arm connected in the working circuit adapted to engage one or the other of the said terminals to govern the amount of effective windings in the circuit, and a torque coil or winding *k* subject to the pressure, substantially as described.

In witness whereof I hereunto subscribe my name this 23d day of May, A. D. 1901.

THOMAS DUNCAN.

Witnesses:
GEORGE L. CRAGG,
HERBERT F. OBERGFELL.