

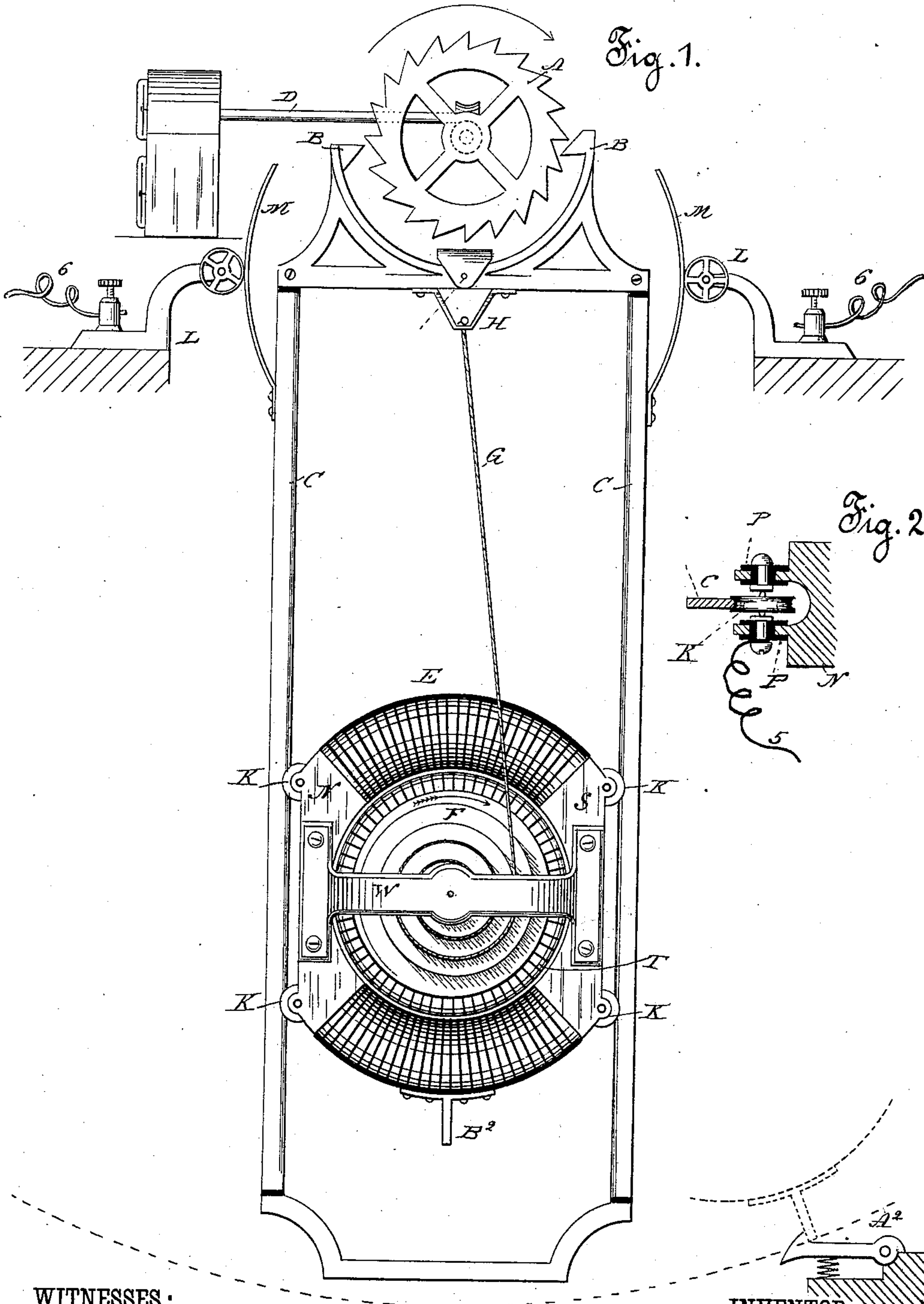
(No Model.)

2 Sheets—Sheet 1.

S. D. MOTT.
ELECTRIC METER.

No. 333,079.

Patented Dec. 22, 1885.



WITNESSES:

INVENTOR:

Edw. Jett.
Thos. Dooney

S. D. Mott
BY *H. B. Townsend*
ATTORNEY

(No Model.)

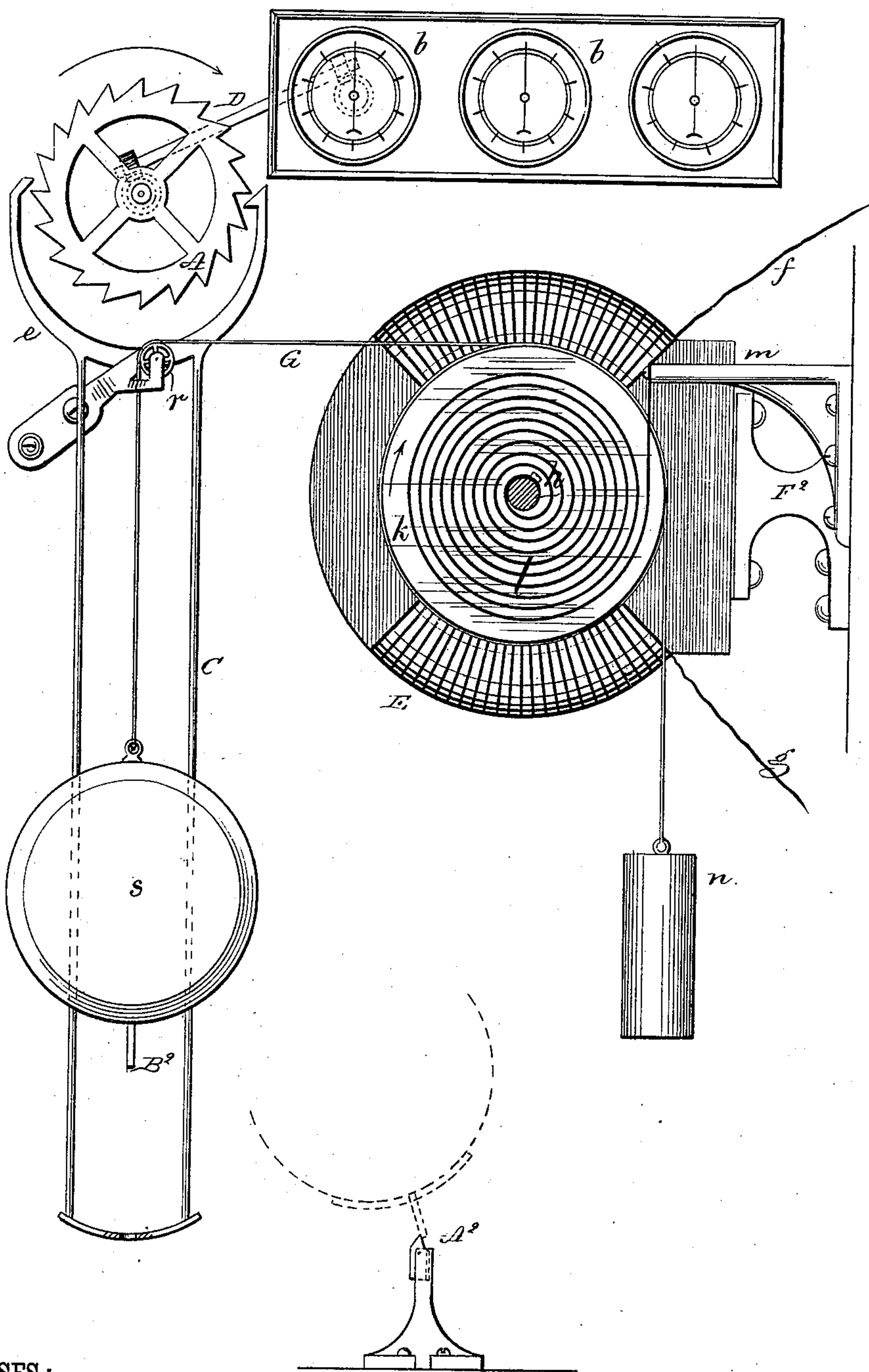
2 Sheets—Sheet 2.

S. D. MOTT.
ELECTRIC METER.

No. 333,079.

Patented Dec. 22, 1885.

Fig. 3.



WITNESSES:

J. C. Worthington
E. H. Scott

INVENTOR:

S. D. Mott
BY *W. L. Townsend*
ATTORNEY

UNITED STATES PATENT OFFICE.

SAMUEL D. MOTT, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS,
TO THE SCHUYLER ELECTRIC LIGHT COMPANY, OF NEW YORK.

ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 333,079, dated December 22, 1885.

Application filed August 24, 1883. Renewed November 27, 1885. Serial No. 184,079. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL D. MOTT, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Meters, of which the following is a specification.

My invention relates to instruments for registering the flow of electric currents, and is more especially designed as an improvement in the kind of meters heretofore patented to me in which the registry is produced by a driven train of wheels operated by a constant power, and the speed of movement of such train is controlled by regulating a retarding mechanism for the train through the agency of the electric current to be registered.

My present invention consists in combining with a train of wheels operated or driven by any suitable power a retarding device consisting of a pendulum adjustable in length by the agency of the electric current to be registered, in such a way that if the current increase the pendulum will be shortened and the driven train will be allowed to move at a greater speed; while, vice versa, if the current decrease the pendulum will lengthen and the train will move at a slower speed.

In the practice of the invention the train itself may carry suitable registration-hands, or it may impart movement to a separate register train of wheels constructed in any suitable manner, and having dials graduated to any desired arbitrary unit. The length of the pendulum may be adjusted either by moving the pendulum rod and weight or by moving the weight independently of the rod itself. The effect is in either case to vary the length of the pendulum, and as a consequence its rate of vibration. I prefer in general to move the pendulum bob or weight, and may effect this by the agency of an electro magnet or motor mounted on the pendulum or on an independent support. If the motor be on the rod, said motor may itself constitute the weight or bob, and may be constructed or mounted in such way that it will lift itself to a higher position when the current increases and will be lowered when the current diminishes. That the action of the motor may be in accordance with the law governing the rate of vibrations

of pendulums, some provision has to be made by which if the current be, say, doubled, the pendulum will be shortened not one half, but so that the square root of its reduced length will be one half the square root of the original length—that is, if the pendulum be sixteen inches long and the current be doubled, the length of the pendulum will be shortened to four inches, in order that the rate of movement of the train and register may be doubled. This result may be attained by the use of a cord wound upon a conical drum, through which the power of the motor is applied in such way that the increased strength of the motor due to the increase of current shall hold the pendulum weight or bob at the proper height to give a corresponding increased movement to the register by the action of the retarded driven train. Other means for adjusting the action of the electric motor or other lifting device might be used, whereby its power to shift or adjust the length of the pendulum shall be proportioned to the well-known laws governing the time of vibration of pendulums. A coiled spring or other retractor or weighing device might be used for the purpose, and the adjustment might be effected by the action of an ordinary electro-magnet, or of a solenoid; though I ordinarily prefer to employ an electric motor, since the lifting-power of the same may be made practically constant for the same current in all positions of the motor mechanism, where, as in the case of the ordinary magnet, the power increases as the armature nears the poles; or, in the case of the solenoid, the power diminishes as the core enters the coils.

Some of the various forms of apparatus that may be used for carrying my invention into effect are shown in the accompanying drawings, in which—

Figure 1 is an elevation of so much of the apparatus as is necessary to an understanding of the invention. Fig. 2 is a longitudinal cross-section of the device for completing the electrical connection to the motor upon the moving pendulum. Fig. 3 shows in elevation a modified method of carrying the invention into practice.

Referring to Fig. 1, A indicates the escape-wheel of any form of mechanism driven by a constant power, and B the escapement-

pallets carried by a frame, C, constituting the pendulum-rod. The mechanism for which A is the escapement is connected with and imparts movement to a register-train of any desired kind through a shaft, D.

At E is indicated an electric motor, preferably of the Gramme type, although it may be of any desired form.

N and S indicate the field pole-pieces of the motor, and F indicates a spiral drum mounted on the armature-shaft of the machine, and having wound upon it a cord, G, connected at H with the pendulum-frame. By this means, when the armature-shaft is rotated, the motor is lifted bodily, and as said motor constitutes in effect the pendulum-bob the result of so lifting it is to shorten the pendulum and increase the rate at which the mechanism driving the register may move.

K K are guide-wheels that serve to guide the motor in the pendulum-frame, and to also convey the electric current from the side rod of the frame to the motor. The electric current to be registered is conveyed to the motor through the side rods of the frame C, electric connection with said side bars being made from the conductor 6 through rollers L, bearing on springs M, carried by the pendulum-frame.

The construction of the wheels K is shown in Fig. 2, where the roller or wheel is illustrated as mounted in bearings insulated in sleeves P, supported from the pole-piece of the motor. A wire, 5, connected to the wheel serves for attachment to the negative or the positive commutator-brush of the motor.

The outline of the armature is indicated at T; but the commutator and its attached parts are not shown, they not being essential to an understanding of the invention.

W is a bracket supported from the field-magnets, in which and a similar bracket on the other side of the machine the armature is supported.

A² indicates a spring-catch upon some suitable fixed support, with which an arm, B², carried by the pendulum-bob, engages, when, owing to the stoppage of current flow, the motor and bob drop to their lowermost position. The catch C² is placed to one side of the pendulum, as shown, so that when it stops the movement of the pendulum, the latter will be held in position where it will resume its swing when the current flows through the motor and lifts it. The drum F is properly proportioned, as before described, so that with a doubling of the current the pendulum will be shortened so that it will vibrate at double the rate.

In Fig. 3 an ordinary pendulum-bob is employed, and is connected by a cord, G, with a stationary motor mounted on a bracket, F². The cord G passes over a roller, r, at the pivotal point of the pendulum, so that the vibrations of the pendulum shall not affect the position of the bob.

The dials of a register of any desired kind

and graduated to any desired arbitrary standard are indicated at b.

The wires which convey the current to the electric motor are indicated at f and g.

A counter-balance for the pendulum-bob is indicated at n.

In place of the spiral drum, Fig. 1, I employ in the present instance a coiled retracting-spring, l, one end of which is connected to the armature-shaft at h, while the other end is connected to a fixed stud, m, so that as the motor revolves and lifts the bob the retracting power of the spring l will gradually increase, and with, say, double the strength of current, will oppose the action of the motor to such an extent that said motor will be able only to hold the bob s in position where the pendulum may vibrate twice as fast.

The general operation of the apparatus will be readily understood from what has been already said as to the general principles of the invention.

The length of the pendulum and the consequent rate at which the constant power may move the register will depend upon the strength of the motor. With an increase of current the pendulum may vibrate faster, and, vice versa, with a decrease its rate of vibration will diminish.

The retracting devices of the motor are, as already described, properly adjusted or constructed with regard to the law governing the rate of vibration of pendulums as dependent upon their lengths.

I have herein described one form of electromagnetic apparatus for adjusting or regulating the length of the pendulum, but do not limit myself to such form, as others may be used without departing from the invention.

What I claim as my invention is—

1. In an electric meter, a driven registering-train, in combination with a regulating-pendulum whose length is automatically varied in accordance with the strength of current, as and for the purpose described.

2. The combination, substantially as described, of a driven train of wheels, a regulating-pendulum, and means for raising the pendulum-bob, energized by the current to be measured, so that with an increased current the pendulum is shortened and the train allowed to move at greater speed, while, vice versa, with a decrease of current the pendulum is lengthened and the speed of movement of the train decreased.

3. The combination, in an electric-current meter, with a driven train of wheels, of an adjustable regulating-pendulum, and means for effecting an automatic adjustment of said pendulum in accordance with the strength of the current.

4. In an electric meter, the combination, with an escapement-wheel, of a pendulum having an adjustable bob, and an electromagnetic lifting device for adjusting said bob, energized by the current to be increased.

5. The combination, with the escapement-

wheel, of a pendulum supporting an electric motor that is energized by the electric current and lifts itself to different heights, according to the strength of the current flowing.

5 6. The combination, with the adjustable pendulum-bob, of an electric motor, and a spiral drum over which is wound the supporting or actuating cord for said bob.

10 7. The combination, substantially as described, of the pendulum-frame and the electric motor supported in said frame by a cord wound upon a spiral drum revolved by the motor, as and for the purpose described.

8. The combination, with the automatically-adjustable pendulum-bob, adjustable by the 15 action of the current, of the catch for engaging with said bob when at its lowermost position.

Signed at New York, in the county of New York and State of New York, this 21st day of 20 June, A. D. 1883.

SAMUEL D. MOTT.

Witnesses:

THOS. TOOMEY,
M. M. FRIEND.

It is hereby certified that Letters Patent No. 333,079, granted December 22, 1885, upon the application of Samuel D. Mott, of New York, New York, for an improvement in "Electric Meters," should have contained the following clause, to wit: "Subject to the limitation prescribed by Section 4887 of the Revised Statutes by reason of English patent No. 4,646, dated September 29, 1882"; and that said patent should be read with this clause inserted in the grant thereof, thereby limiting its term, and to make it conform to the files and records pertaining to the case in the Patent Office.

Signed, countersigned, and sealed this 29th day of December, A. D. 1885.

[SEAL.]

H. L. MULDROW,
Acting Secretary of the Interior.

Countersigned:

R. B. VANCE,
Acting Commissioner of Patents.