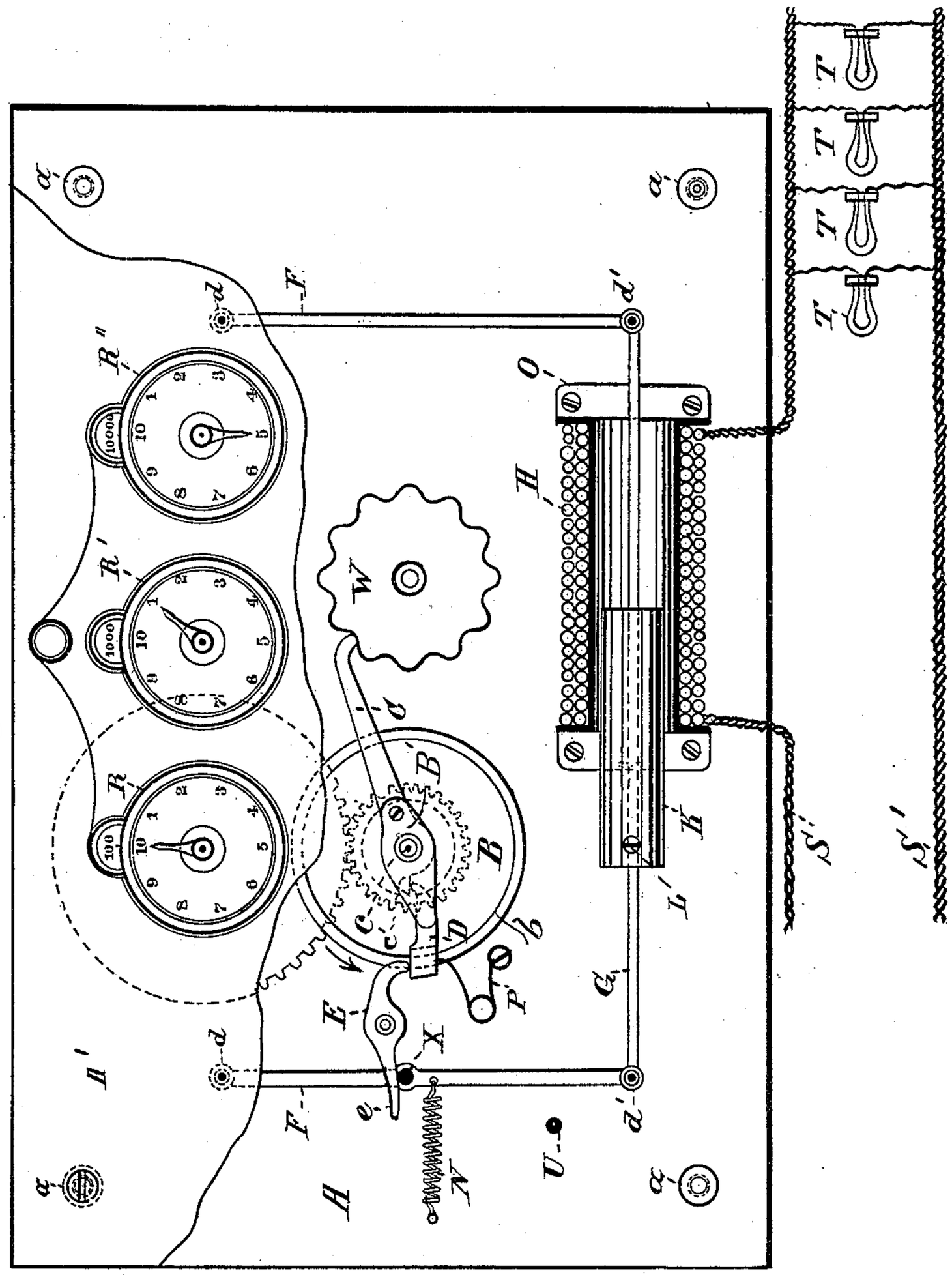
(No Model.) 3 Sheets—Sheet 1.

# R. & P. DIEHL.

## ELECTRIC METER.

No. 405,399. Patented June 18, 1889.

Fig. 1.

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## ELECTRIC METER.

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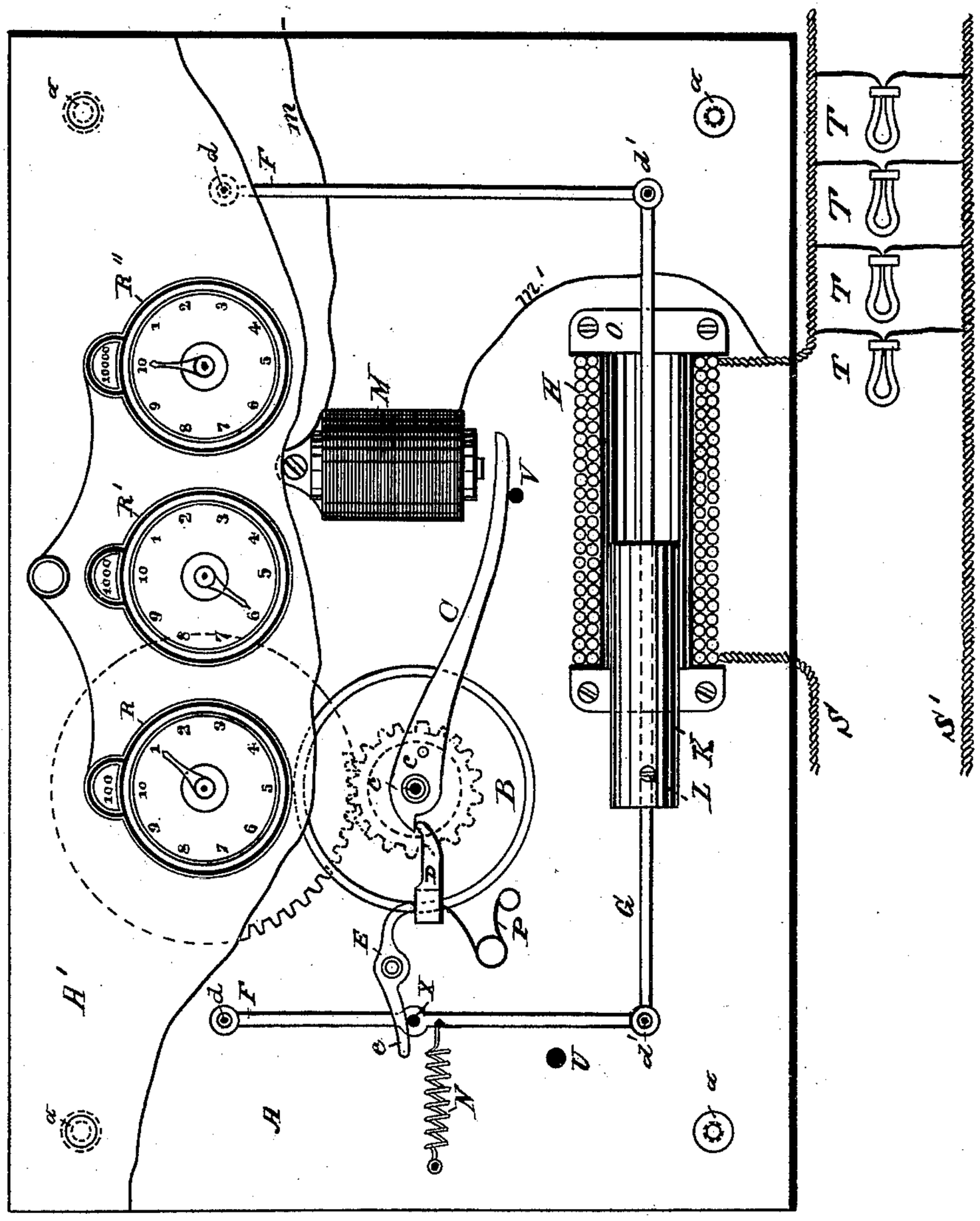
Fig. 2.

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## ELECTRIC METER.

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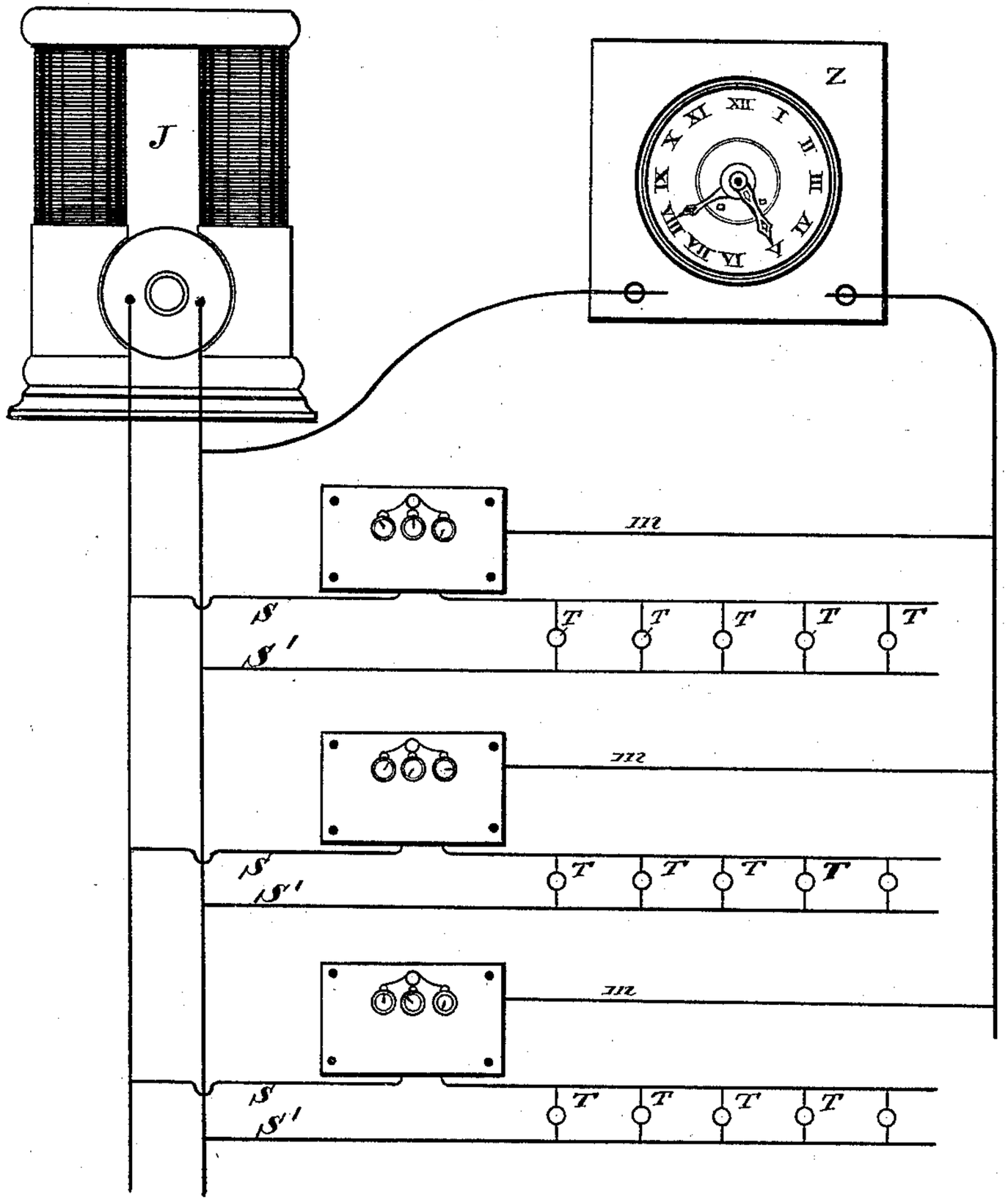
**Fig. 3.**

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# UNITED STATES PATENT OFFICE.

RUDOLF DIEHL, OF NEW YORK, N. Y., AND PHILIP DIEHL, OF ELIZABETH, NEW JERSEY.

## ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 405,399, dated June 18, 1889.

Application filed February 21, 1889. Serial No. 300,740. (No model.)

*To all whom it may concern:*

Be it known that we, RUDOLF DIEHL and PHILIP DIEHL, citizens of the United States, residing, respectively, in New York, in the county and State of New York, and in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Electric Meters, of which the following is a specification.

The object of the invention is to provide a simple and reliable meter for registering the quantity of electricity consumed at a given point.

The invention will be readily understood by those skilled in the art by inspecting the accompanying drawings, in which—

Figures 1 and 2 each show a front view of a meter embodying the invention, with part of the front covering removed, exhibiting the moving parts and the circuits in diagram; and Fig. 3 shows in diagram the arrangement of the meters in the distributing-circuits and of the circuit which supplies the meters with motive power.

Referring to Fig. 1, the main lines of distribution S and S′ include the solenoid H and the lamps or translating devices T. The core K of the solenoid H is connected with the links F F through the rod G, which passes through the core K, and is adjustable by means of the screw L. The links are pivoted at the points *d d* and *d′ d′*, thus partaking of the motion of the core K into and out of the coil H. The spring N normally tends to hold the core out of the solenoid by drawing back the link F, and when no current is flowing the latter rests against the stop U.

The wheel W, notched or indented upon its outer edge, as shown, has a constant revolution given it by any suitable means, as clockwork. The lever C has its curved end resting upon the periphery of the wheel W, and is pivoted at the point *c*. The short end of this lever, shaped as shown at *c′*, engages the end of a clutch-lever D. The wheel B, having its center at *c*, is provided with a projecting rim, and the lever D clutches this rim within a recess formed in its end for that purpose, the recess being very slightly wider than the projecting rim of the wheel. The clutch-lever D is held in its place by means of the plate B′, and the end which clutches the rim of the wheel B is held between the spring P and the curved end of the lever E. The other end *e* of this lever E is also formed into a curve, and it rests upon the pin *x*, carried by the link F. The curve upon the lower side of E is an irregular one—that is, it grows sharper along the lower edge from the point *e* at the end toward the pivot which supports the lever. The result is that as the core is drawn farther into the coil by increase of current the pin *x* approaches nearer to the point of support of the lever E, and on account of the sharper curve of the lever at that part the end which rests upon the clutch D is raised farther, the clutch has a longer range of movement, and the wheel B is turned at a faster rate. The curve of the lever E is a compensating one for the movement of the core, and it will readily be seen from this description that as the distance the core moves into the coil decreases with each equal increase of current the clutch is moved a proportionately greater extent as the core moves into the coil, and the link F carries the pin *x* farther toward the center or point of support of the lever E.

It will readily be seen that as the wheel W turns at a uniform rate the lever C is caused to move up and down regularly, and this motion is communicated also to the clutch-lever D, the position of which upon the periphery of the wheel B depends upon the position of the lever E. When the core K is drawn out farthest from the coil H, so that the link F rests against the stop U, the clutch-lever D is in such a position that the impulses given from the wheel W through the lever C will not move the wheel B at all; but as the core K is drawn into the solenoid and the pin *x* is carried nearer to the center of motion of the lever E, the clutch D has a greater motion along the rim of the wheel B, each impulse carrying it a certain distance in the direction shown by the arrow. The device thus operating to drive the wheel B is known as a "friction-clutch" or "clutch-feed." The wheel B being carried forward in the manner described at a rate varying with the position of the core K within the solenoid H, gives mo-

tion to the train connected with the dials R, R′, and R², and by means well understood the extent of the motion, and hence the quantity of electricity consumed, is thereby registered. In Fig. 2 the same principle is illustrated, except that in place of the regularly-revolving wheel an electro-magnet M is used, having its armature at the end of the lever C, the extent of motion of the lever being regulated by the distance of the stop V from the poles of the magnet. The electro-magnet M is vitalized at regular intervals through the wires *m* and *m′* by means, say, of a clock provided with a suitable circuit-closer. As that feature of the invention is well known, it is not thought necessary to include it in the drawings. By means of the regular movements of the lever C the clutch-lever D is operated in precisely the same manner as is described with reference to Fig. 1, and the position of the core K within the solenoid H determines the rate of motion at which the wheel B is carried forward, and therefore that of the train of wheels connected with the dials R, R′, and R².

Referring to Fig. 3, the distributing-circuit is illustrated, together with a method of connecting the circuit used for operating the meters. In this case the translating devices T T are in each branch from the main circuit connected in multiple with the meters, and the meters are all connected also with the clock Z, which furnishes to each the regular impulses required to operate the electro-magnets which operate the meters, as described with reference to Fig. 2. It will be seen that the current passing through the clock, and thus supplying the meters, is a shunt upon the main circuit, but an independent circuit could be used equally well; and it will also be plainly seen by any one skilled in the art how the meters can be placed in series in the circuit as well as in multiple arc, or in any other desired relation to the distributing-circuit.

We claim as our invention—

1. In an electric meter, the combination of a train of wheels and indicating-dials, a friction-clutch applied to one of said wheels, means, substantially as described, for giving regular impulses to a lever operating upon said friction-clutch, a solenoid in the translating-circuit, a movable core therefor, mechanism connected with said core, which governs the extent of motion of said friction-clutch, whereby variable motion is given to said wheels according to the position of said core.

2. In an electric meter, the combination of a solenoid, a movable core therefor, mechanism connected with said core, a train of wheels with indicating-dials, a friction-clutch applied to one of said wheels, means, substantially as described, for giving regular impulses to said friction-clutch when a current is passing, and a lever operating upon said friction-clutch through the mechanism attached to said core, whereby the amount or rate of motion given to the wheels depends upon the position of said core.

3. The combination of the solenoid, its core, the clutch D, means, substantially as described, for operating said clutch at regular intervals when a current is passing, the wheel B, having its rim grasped by said clutch D, the train connected therewith, the lever E, which determines the amount of motion given to the wheel B by the clutch, and the springs P and N.

4. The combination of the solenoid, its core, the clutch D, means, substantially as described, for operating said clutch at regular intervals when a current is passing, the wheel B, having its rim grasped by said clutch, the train connected therewith, and the lever E, having a curve of such form as to compensate the decreased rate of movement of said core on an increase of current by an increased range of movement of said clutch.

5. The combination of an electro-magnetic device operated upon by the current to be measured, an intermittently-operated friction-clutch, substantially as described, and a registering apparatus driven by said friction-clutch at a rate determined by the position or condition of said electro-magnetic device.

In testimony whereof we have hereunto subscribed our names this 18th day of February, A. D. 1889.

RUDOLF DIEHL.
PHILIP DIEHL.

Witnesses:
J. G. GREENE,
P. J. RYAN.