J. HARRIS.

ELECTRIC METER.

APPLICATION FILED MAY 3, 1909. RENEWED JULY 5, 1910.

970,498. Patented Sept. 20, 1910.

2 SHEETS—SHEET 1.

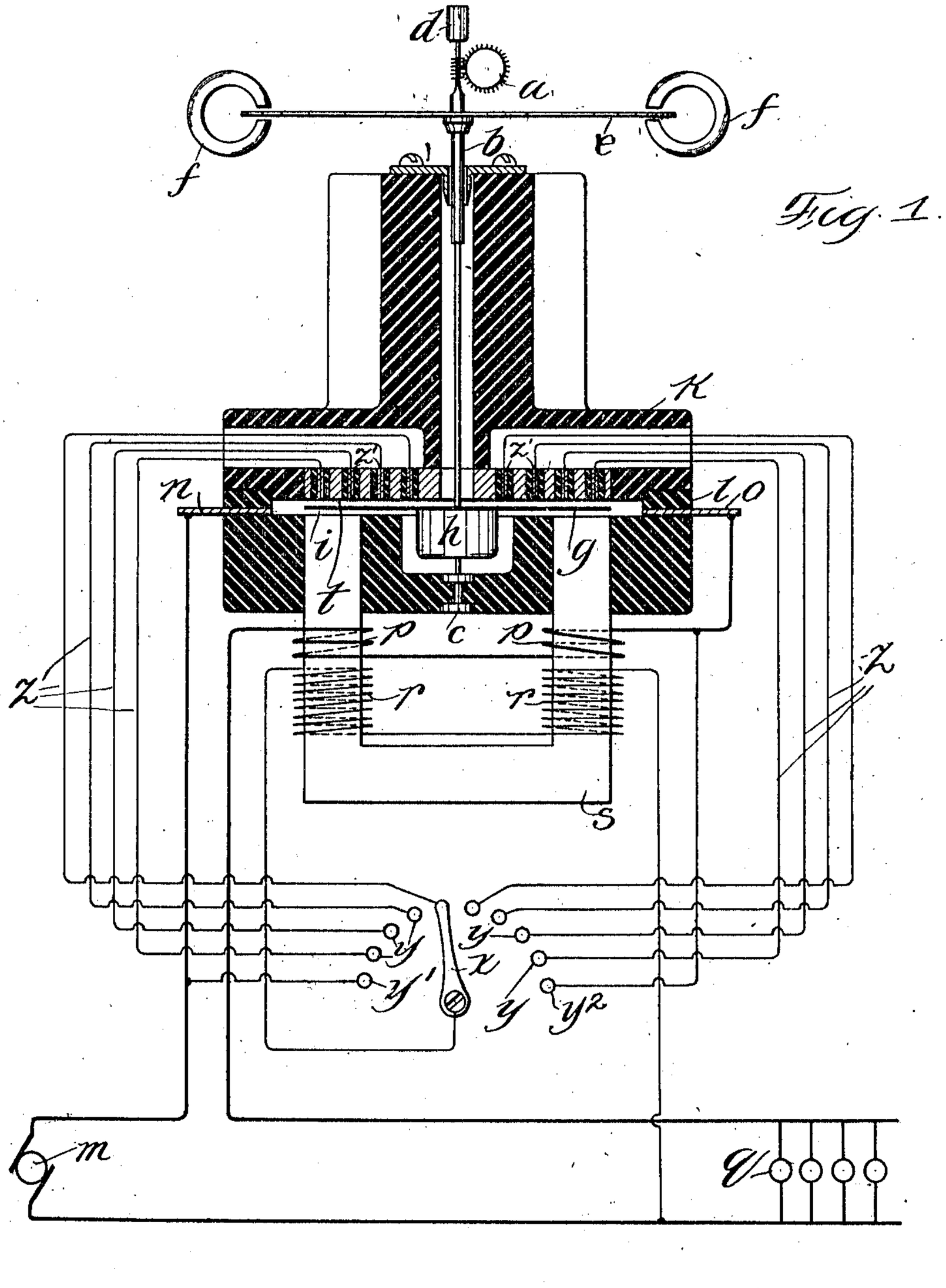

Fig. 1.

WITNESSES:

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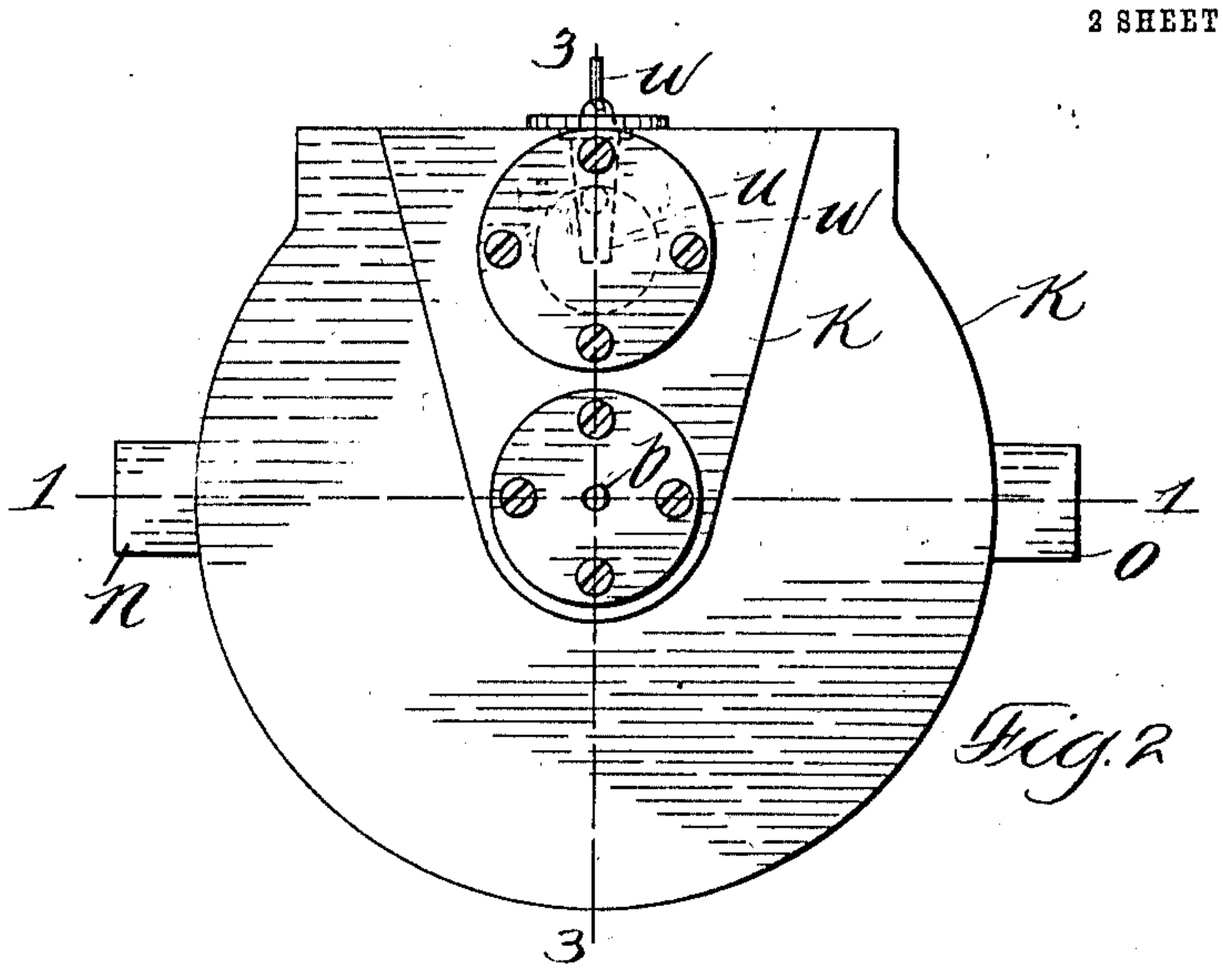

Fig. 2

Fig. 4.

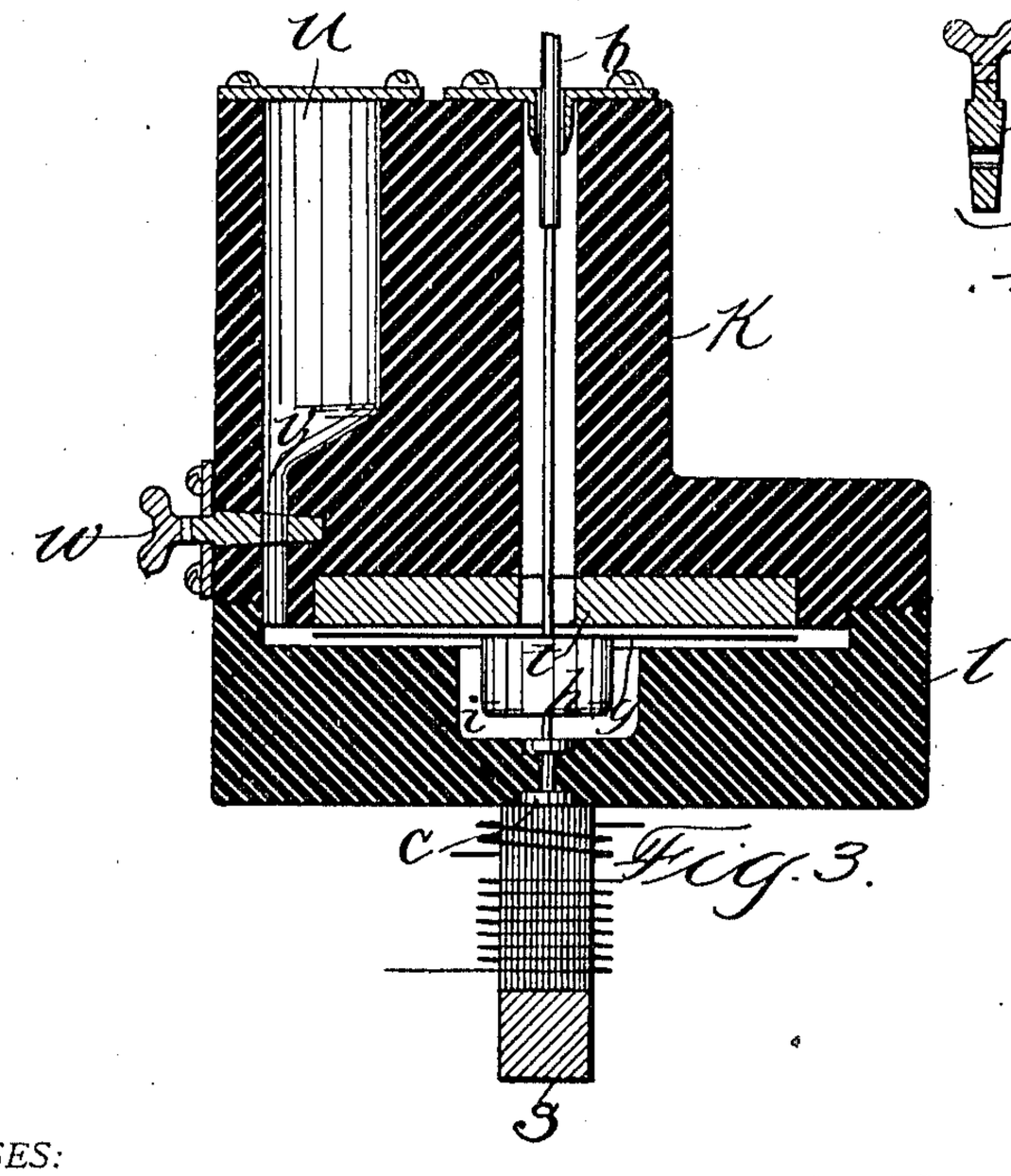

Fig. 3.

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UNITED STATES PATENT OFFICE.

JESSE HARRIS, OF LA FAYETTE, INDIANA, ASSIGNOR TO DUNCAN ELECTRIC MANUFACTURING COMPANY, OF LA FAYETTE, INDIANA, A CORPORATION OF ILLINOIS.

ELECTRIC METER.

970,498. Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed May 3, 1909, Serial No. 493,543. Renewed July 5, 1910. Serial No. 570,398.

To all whom it may concern:

Be it known that I, JESSE HARRIS, citizen of the United States, residing at La Fayette, in the county of Tippecanoe and State of Indiana, 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 electric meters of the class in which a liquid, preferably mercury, is employed for conveying current to and from the armature, which is immersed in, or is in contact with, the liquid.

It is one of the objects of my invention to provide means whereby the liquid may be securely retained during shipment of the meter to prevent loss thereof in transit, and the invention has for another of its objects the provision of improved means for compensating for friction in the bearings or working parts of the instrument.

I will set forth my invention by a description of the preferred embodiment thereof, shown in the accompanying drawings, and will more particularly point out the invention in the claims.

In the drawings—Figure 1 is a sectional elevation on line 1 1 of Fig. 2, of a meter constructed in accordance with my invention, the circuit connections of the meter being diagrammatically indicated. Fig. 2 is a plan view of the structure shown in Fig. 1, the damping-disk being omitted. Fig. 3 is a sectional elevation on line 3 3 of Fig. 2. Fig. 4 are views of one form of valve mechanism that enters into the device of my invention.

Like parts are indicated by similar characters of reference throughout the different figures.

In the embodiment of the invention illustrated, I have indicated a counting-train *a* in gear with a meter-shaft *b* having a step-bearing *c* at its lower end and a lateral-thrust-bearing *d* at its upper end, the shaft *b* carrying a damping disk *e* rotating in the fields of the permanent magnets *f*, the shaft of the meter also carrying a disk-armature *g*. The shaft *b* also carries a flotation-element *h* that serves to buoy the armature and the meter-shaft, the elements *g* and *h* being located within a liquid or mercury chamber *i* formed by the assembled elements *k* and *l* of a casing formed of insulating material. The chamber *i* is designed to contain mercury that will extend above the armature disk *g*, the mercury being included in serial relation with a main of the distribution circuit with which the meter is associated, the circuit including the bath of mercury being traceable from the source of current *m* to a terminal *n*, through the mercury and the armature *g* in the mercury, to the terminal *o*, thence through the series field winding *p* to the load *q*. The meter, when constituting a watt meter, also includes a pressure circuit that contains the pressure winding *r*. The windings *p* and *r* are provided with a magnetic core *s*, desirably of horse-shoe form, whose free polar ends are in a plane parallel with the armature-disk *g* and are preferably presented at right-angles to the plane of said armature-disk. There is located above the disk *g*, a body of iron *t* which coöperates with the core *s* to afford a circuit for the lines of force set up by the windings *p* and *r*.

As is well known by those skilled in the art, it is very difficult to ship mercury meters owing to the fact that the mercury is very liable to work out through the cracks and small openings encountered in the mercury chamber and the parts communicating therewith. I have avoided this objectionable feature in mercury meters by providing a storage chamber *u* in the meter casing, which storage chamber is adapted to contain sufficient mercury for the mercury chamber of the meter, the storage chamber being connected with the meter mercury chamber by a passage *v*, a valve *w* being disposed in this passage to permit the mercury to flow from the storage chamber *u* to the meter mercury chamber that contains the armature. In the preferred embodiment of the invention, the storage chamber *u* is located above the armature *g* and the meter mercury chamber containing said armature, so that when the meter has arrived at its destination, it will be sufficient merely to turn the valve *w* to an open position, whereupon the mercury will flow into the meter mercury chamber properly to immerse the armature and place the meter in working condition. In the preferred practice of my invention, the storage chamber *u* is only sufficiently large to contain the mercury that is needed in the meter, so that during shipment there

is no space within the storage chamber u that is unfilled by mercury. In this way the mercury will not in its agitation become intermixed with the air to form dross.

In order to compensate for friction, I provide a switch-arm x connected with one side of the distribution circuit, preferably through the pressure-winding r, and contact-buttons y connected with the other side of the distribution circuit through the mercury within the armature chamber. The conductors z that connect the buttons y electrically with the mercury, are tightly inclosed within the bores of small metallic tubes z^1 that are passed through, but are insulated from, the iron-disk t, these tubes contacting at their lower ends with the mercury in the mercury chamber. The tubes z^1 are located varying distances from each of the terminals n and o, so that more or less of the mercury is included in serial relation with the pressure winding r of the meter, whereby friction may be compensated for, this result being gained without disturbing calibration of the meter, inasmuch as the resistance variation due to the varying quantities of mercury that may be included in circuit by the switch x, is negligible. When the meter is thus organized, the series portion, which operates to effect rotation of the meter, is included in circuit when a load is in operation. A sufficient portion of the mercury that is included in the series circuit, is, by means of the switch x, always in circuit, whether or not the load is present or absent, to coöperate with the pressure circuit of the meter, almost to start the meter, this starting tendency being regulated to counterbalance the friction, so that when a load portion is included in circuit, the meter will operate. A button y^1 is also associated with the switch x, this latter button being connected directly with the same main with which the buttons y are connected, the button y, however, not depending upon the mercury for its connection with said main. The button y^2 has a connection with said main through the entire bath of mercury, the circuit being traced, when the switch-arm x rests upon the button y^2, from the pressure-winding r and the main of the distribution circuit connected directly therewith, through the switch-arm x, the button y^2, the terminal o, the mercury, the terminal n, to the companion main of the distribution circuit. When the greatest offset to friction is to be provided, the switch-arm x is placed in connection with the button y^2, decreasing degrees of friction compensation being afforded as the switch-arm x successively encounters the buttons as said switch-arm is moved toward the left, said switch-arm, when engaging the button y^1, including none of the mercury in circuit, there then being no friction compensation.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the precise construction shown, as changes may readily be made without departing from the spirit of my invention.

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

1. An electric meter including an armature, a liquid-containing chamber inclosing said armature, a storage chamber serving to hold the liquid to be used in the aforesaid chamber, a passage intervening between said chambers, and a valve in said passage for preventing or permitting flow between said chambers.

2. An electric meter including an armature, a liquid-containing chamber inclosing said armature, a storage chamber serving to hold the liquid to be used in the aforesaid chamber, a passage intervening between said chambers, and means for preventing or permitting flow between said chambers.

3. An electric meter having current and pressure-circuits and including a chamber inclosing the meter armature and holding liquid which forms a part of the current-circuit, and regulable means whereby varying portions of the liquid may also be included in the pressure-circuit.

4. An electric meter including an armature, a liquid-containing chamber inclosing said armature, circuit connections whereby the liquid may be included serially in a distribution circuit, and regulable means whereby varying portions of the liquid may be included across the mains of the distribution circuit.

In witness whereof, I hereunto subscribe my name this 30th day of April A. D., 1909.

JESSE HARRIS.

Witnesses:

BERT L. EMENS,

THOMAS DUNCAN.