

No. 698,678.

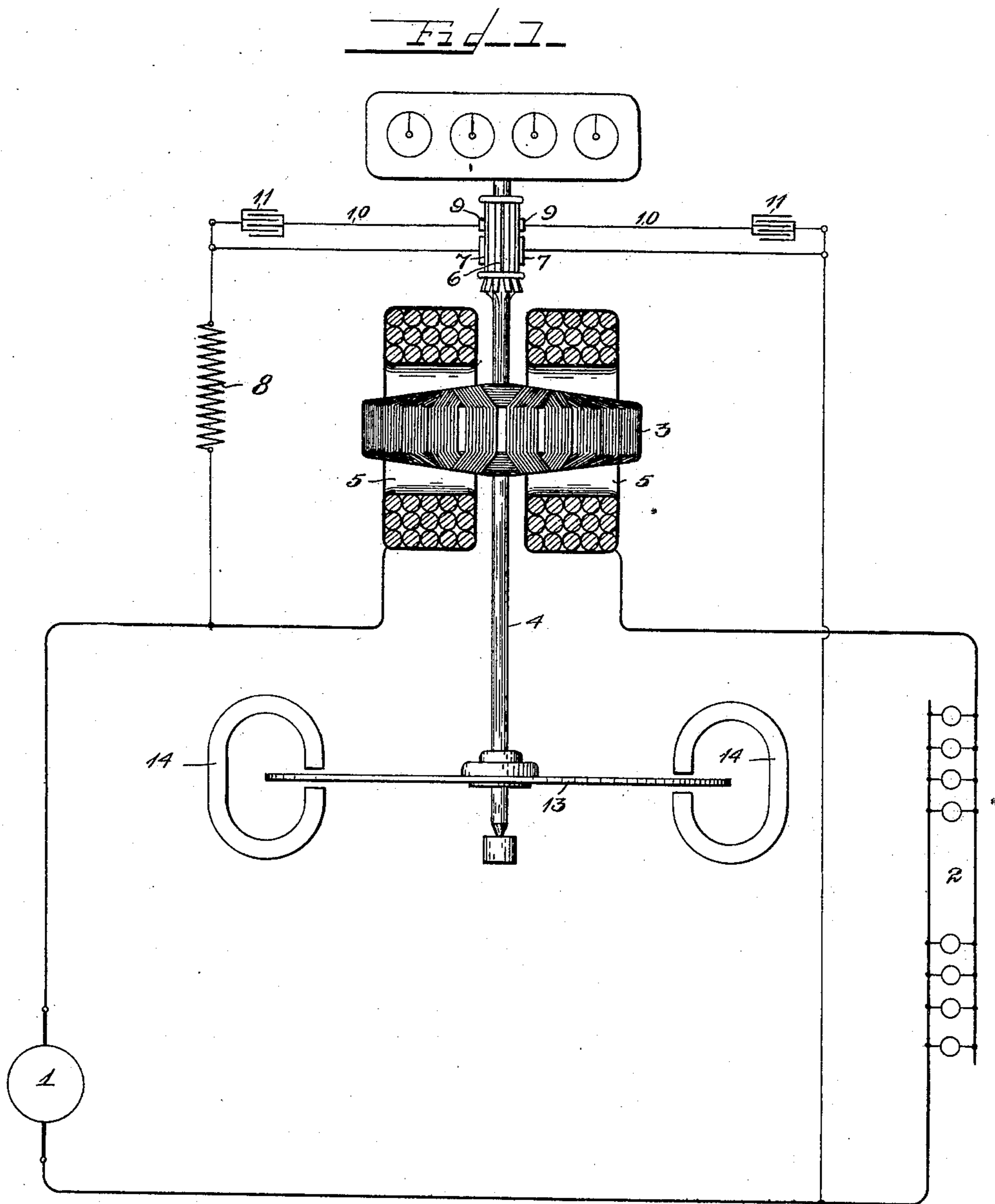
Patented Apr. 29, 1902.

T. DUNCAN.
ELECTRIC METER.

(Application filed Jan. 2, 1900. Renewed Jan. 6, 1902.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES

Max H. Zabel.
C. J. Schmitt

BY

INVENTOR
THOMAS DUNCAN
Charles A. Brown & Cragg
ATTORNEYS

No. 698,678.

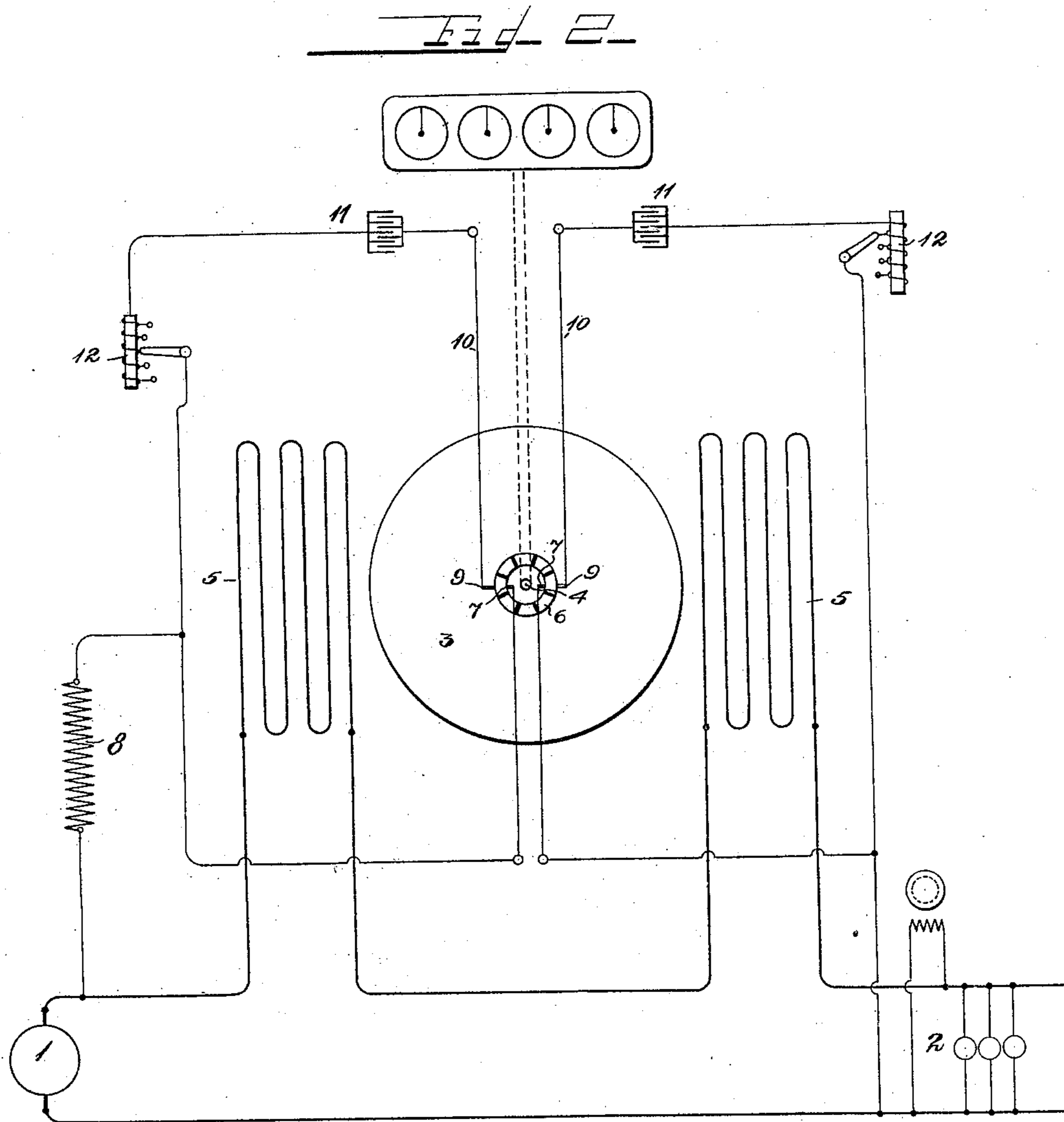
Patented Apr. 29, 1902.

T. DUNCAN.
ELECTRIC METER.

(Application filed Jan. 2, 1900. Renewed Jan. 6, 1902.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses—

Max Label.
C. J. Schmidt.

Inventor—

THOMAS DUNCAN

By

Charles A. Brown & Co.

Attorneys

UNITED STATES PATENT OFFICE.

THOMAS DUNCAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE SIEMENS & HALSKE ELECTRIC COMPANY OF AMERICA, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 698,678, dated April 29, 1902.

Application filed January 2, 1900. Renewed January 6, 1902. Serial No. 88,488. (No model.)

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, (Case No. 326,) 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 motor-meters, and particularly to that class of motor-meters in which current is conducted to a movable element through the agency of brush and collector terminals.

My invention is particularly applicable to those forms of motor-meters in which the armature-winding is adapted for inclusion in bridge between the supply-mains, current being conveyed to the armature by means of a commutator and commutator-brushes. In meters of this class injurious sparking frequently occurs between the commutator and commutator-brushes, which in time will impair the delicacy of the instruments, frequently to such an extent as to prevent them from operating on small loads.

My invention has for its object the provision of an improved form of meter of the class described adapted for the measurement of alternating or direct current in which this objectionable sparking is eliminated, and by means of my invention commutated motor-meters may be constructed which will be free of objections heretofore existing in meters of this class. The objectionable features heretofore existing were due mainly to this injurious sparking at the commutator, which might have several causes, as the presence of dust upon the commutator and the vibration of the meter when located in places where it will be subject to vibration, as in buildings where machinery is running, or due to heavy traffic in the neighborhood. The dust and the vibration cause the brushes to break contact with the commutator-segments, causing small arcs where the ruptures in contact occur, as is well understood. These minute arcs when frequently occurring soon cause roughness in the surfaces of the commutator

and the brushes, it frequently happening that the line of contact of the brushes with the commutator will become so rough that the meter will not operate on small loads due to increase in friction.

Meters are frequently subjected to such a severe degree of vibration in certain localities as to make the use of commutated meters in such localities almost impracticable. Moreover, the brushes and commutators of commutated meters as heretofore constructed frequently require cleaning and repolishing.

In accordance with my invention I provide a by-path serving when a brush breaks contact with a commutator-segment to prevent the formation of sparks. I include capacity in this by-path for the purpose of receiving the inductive discharge occasioned upon the break. In the preferred embodiment of my invention I employ in connection with commutated motor-meters a supplemental pair of brushes having contact with the same segments of the commutator with which the main brushes have contact, this supplemental pair of brushes constituting the terminals of by-paths or shunt-circuits about the main brushes. I preferably include a condenser in circuit with each supplemental contact-brush, there thus being two condensers in the shunts or by-paths about the main brushes, the commutator being disposed between the said condensers. In order to prevent the supplemental brushes from being removed from contact with the commutator, I preferably form the same considerably narrower than the main brushes and increase the tension of the supplemental brushes upon the commutator to maintain firm contact between the commutator and the said supplemental brushes, so that the supplemental brushes will not readily be removed from the commutator due to the meter's vibration or other cause.

I will explain my invention more particularly by reference to the accompanying drawings, illustrating one embodiment thereof, in which—

Figure 1 is a view in elevation, with the field-coil shown in section, of a meter constructed in accordance with my invention,

the circuit connections thereof being indicated diagrammatically. Fig. 2 is a diagrammatic view of the meter, showing its circuit connections.

5 Like parts are indicated by similar characters of reference in the views.

A source of current 1, which may furnish either alternating or direct current, is shown in Fig. 1 as supplying current to translating
10 devices 2.

In Fig. 2 a source of current 1 furnishes alternating current to the translating devices 2. An armature 3, composed of coils of fine wire, is mounted upon the rotating spindle 4,
15 a series winding, in this instance divided into two coils 5 5, being included in series with one of the main conductors extending from the source of current to the translating devices. These coils may be located upon opposite sides of the spindle 4, as shown, the armature projecting within the interior of the said coils. Said series winding is thus included in series with the translating devices and sets up a magnetic field that is proportional to the current strength. The coils
25 of the armature 3 are connected with the segments of the commutator 6 in the usual way, the main commutator-brushes 7 serving to include the armature in a bridge between the main leads extending from the generator.
30 The armature and field cooperate to effect measurement of the power in the work-circuit; but I do not wish to be limited to the application of my invention to wattmeters. I preferably also include in series with the armature the non-inductive resistance 8. A second or supplemental pair of brushes 9 9
40 is provided, these brushes being preferably of less width and lighter than the main brushes, the supplemental brushes thereby being more elastic, so that they may be pressed firmly enough upon the commutator to prevent their being affected by vibration or dust. Each brush 9 includes in its circuit connection
45 10 a condenser 11. The relative disposition of the main and supplemental brushes is preferably such that the brushes upon each side of the commutator simultaneously engage the same commutator-segment. The condensers and the supplemental brushes are practically out of circuit when the main brushes are in contact with the commutator, since the only electromotive force to which they are subjected is the ohmic or C R drop
55 through the armature or between the main brushes. If one of the brushes 7 is raised from the commutator, the brush supplementing the said main brush and the condenser connected with the supplemental brush are instantly brought into circuit to receive the inductive discharge. Thus each main brush has its own condenser and condenser-brush, as one brush usually only leaves the commutator at a time. I preferably adjust each
60 condenser to neutralize the self-induction in the armature-circuit.

In Fig. 2 I have shown more clearly and

diagrammatically how each main brush and its supplemental brush are in engagement with the same commutator-segment. Since
70 the self-induction in the armatures of different meters varies, I have found that it is better practice to make the condensers for the different meters alike, giving them a little more capacity than is absolutely required for
75 the proper operation of any of the meters and then neutralizing a portion of the capacity, which may be accomplished by means of an adjusting self-induction coil 12 in circuit with each condenser, the inductance being adjusted
80 until the sparking ceases. By this arrangement I am enabled to effect the adjustment of the meter speedily.

I have provided a disk 13 upon the lower end of the armature-shaft and have inductively associated therewith two permanent
85 magnets 14 14, the disk and magnets cooperating to retard the rotation of the armature.

While I have herein shown and particularly described one embodiment of my invention,
90 it is obvious that other embodiments thereof may be devised without departing from the spirit of the invention, and I do not, therefore, wish to be limited to the precise apparatus herein shown and particularly described;
95 but,

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

1. The combination with a commutated motor-meter, of a by-path for the commutator of the meter which includes capacity, and adjusting inductance to partially neutralize the capacity, substantially as described.

2. The combination with a motor-meter provided with collector and brush terminals for conveying current to the revoluble member of the meter, of a by-path for said terminals including capacity, and adjusting inductance to partially neutralize the capacity, substantially as described.

3. The combination with a commutated motor-meter including a main brush for contact with the commutator, of a brush supplementing the main brush and included in a by-path
115 about the same, said by-path including capacity, and adjusting inductance to partially neutralize the capacity, substantially as described.

4. In a system of electrical distribution, the combination with a source of current-supplying translating devices, of a motor-meter having a revoluble armature included between the main conductors, a commutator for the armature, main commutator-brushes for engaging the commutator and supplying current to the armature, supplemental commutator-brushes also engaging the commutator and including capacity in circuit therewith, and adjusting inductance to partially
120 neutralize the capacity, substantially as described.

5. In a system of electrical distribution, the combination with a source of current-supply-

ing translating devices, of a motor-meter having a revoluble armature included between the main conductors, a commutator for the armature, main commutator-brushes for engaging the commutator and supplying current to the armature, supplemental commutator-brushes also engaging the commutator, each supplemental brush being included in a by-path about a main brush, and two condensers one in circuit with each supplemental brush, adjusting inductance being included in circuit with each condenser to partially neutralize the capacity, substantially as described.

6. In a system of electrical distribution, the combination with a source of current-supplying translating devices, of a motor-meter having a revoluble armature included between the main conductors, a commutator for the armature, main commutator-brushes for engaging the commutator and supplying current to the armature, supplemental commutator-brushes also engaging the commutator, each supplemental brush being included in a by-path about a main brush, and two condensers, one in circuit with each supplemental brush, each main commutator-brush and the brush supplementing the same simultaneously engaging the same commutator-segment, adjusting inductance being included in circuit with each condenser to partially neutralize the capacity, substantially as described.

7. The combination with a commutated motor-meter, provided with two main brushes for engagement with the commutator, of two additional brushes each supplementing a main brush and included in a by-path, having capacity, about the same, said by-path also including adjusting inductance, substantially as described.

8. The combination with a commutated motor-meter including a main brush for contact with the commutator, of a brush supplementing the main brush and engaging the same commutator, the said brushes being connected at their free ends through capacity, substantially as described.

9. The combination with a commutated motor-meter provided with two main brushes engaging the same commutator, of two additional brushes, each supplementing a main brush, each main brush being united at its

free end with the free end of its supplemental brush through capacity, substantially as described.

10. The combination with a commutated motor-meter, of main and supplemental brushes therefor, the latter bearing with greater pressure upon the commutator than the former, capacity being included in circuit with said main and supplemental brushes, substantially as described.

11. The combination with a commutated motor-meter, of main brushes for conveying current thereto, supplemental brushes bearing with greater pressure, upon the same commutator, than the main brushes, each main brush and its supplemental brush engaging the same segment of the commutator, and a condenser connected directly between each main brush and its supplemental brush, substantially as described.

12. The combination with a commutated motor-meter, of main brushes for conveying current thereto, supplemental brushes bearing with greater pressure, upon the same commutator, than the main brushes, and a condenser connected directly between each main brush and its supplemental brush, substantially as described.

13. The combination with a commutated motor-meter, of a wide main brush serving in part to convey current to the meter, and a supplemental brush of smaller width than the main brush and bearing with greater pressure upon the commutator, capacity being included in circuit with said main and supplemental brushes, substantially as described.

14. The combination with a commutated motor-meter, of a wide main brush serving in part to convey current to the meter, and a supplemental brush of smaller width than the main brush and bearing with greater pressure upon the commutator, capacity being included in circuit with said main and supplemental brushes, said main and supplemental brushes engaging the same segment of the commutator, substantially as described.

In witness whereof I hereunto subscribe my name this 20th day of December, A. D. 1899.

THOMAS DUNCAN.

Witnesses:

WILLIAM F. MEYER,
JAMES W. DALTON.