

(No Model.)

E. W. SIEMENS.
ELECTRIC METER.

No. 415,577.

Patented Nov. 19, 1889.

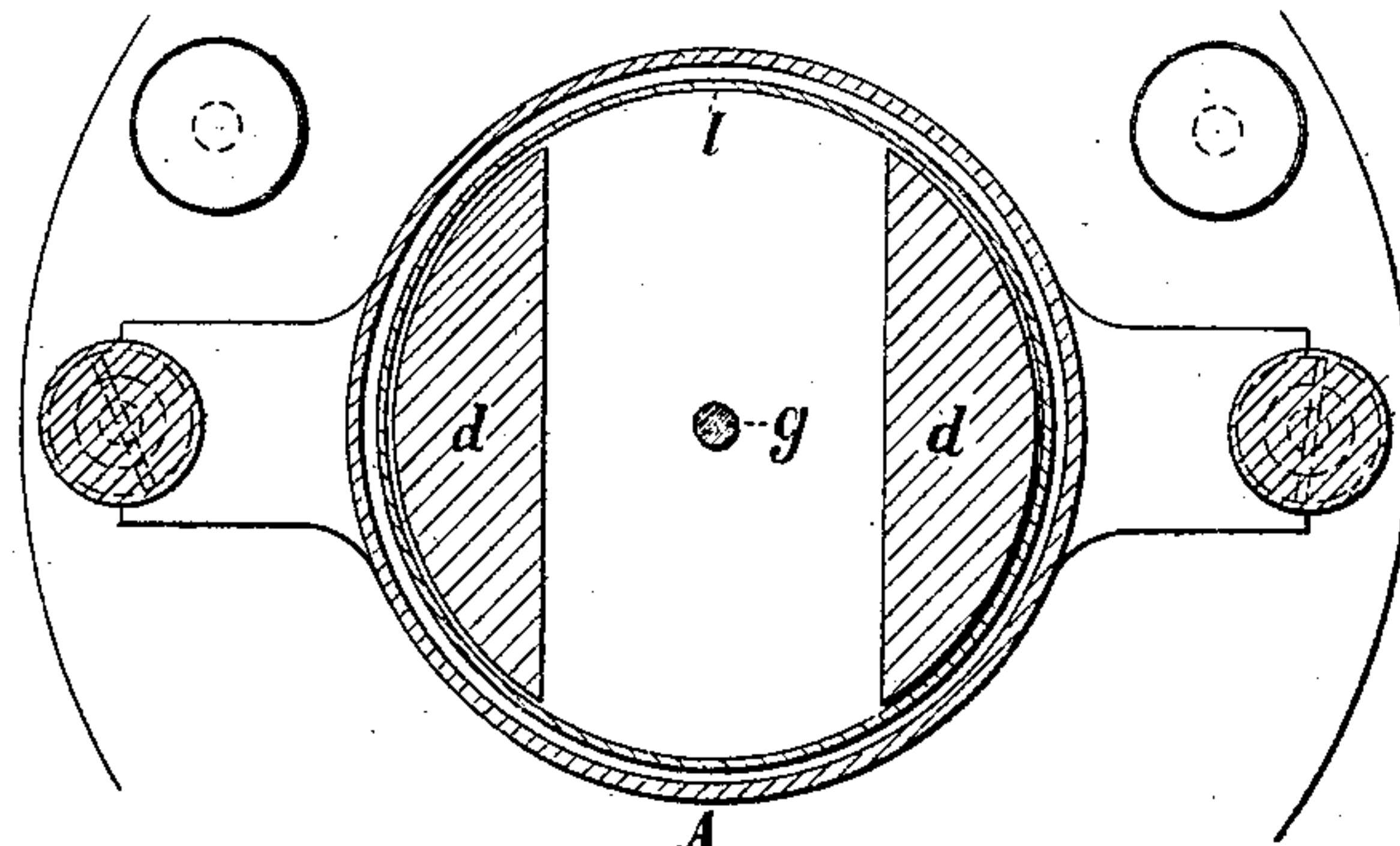


Fig. 2.

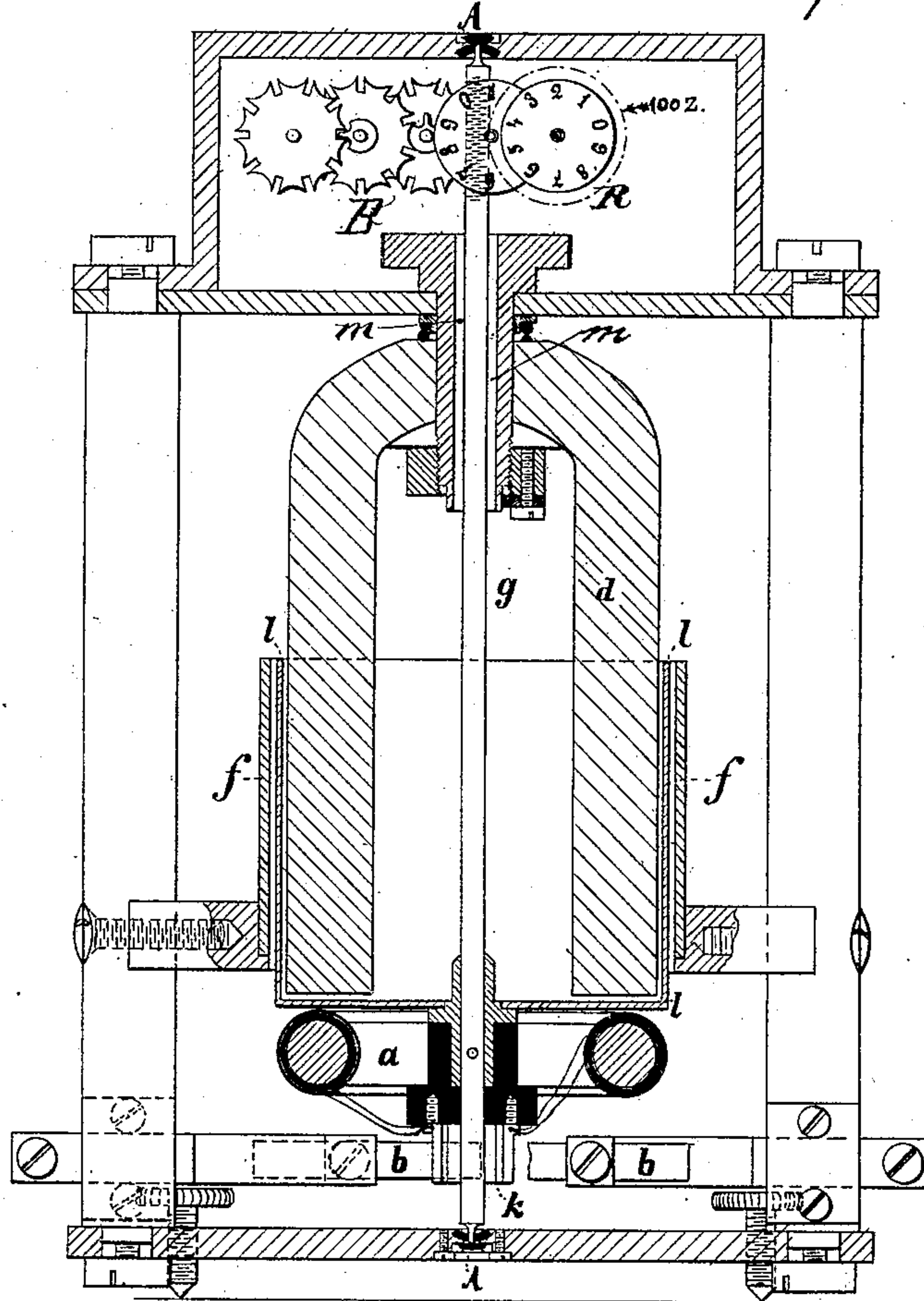


Fig. 1.

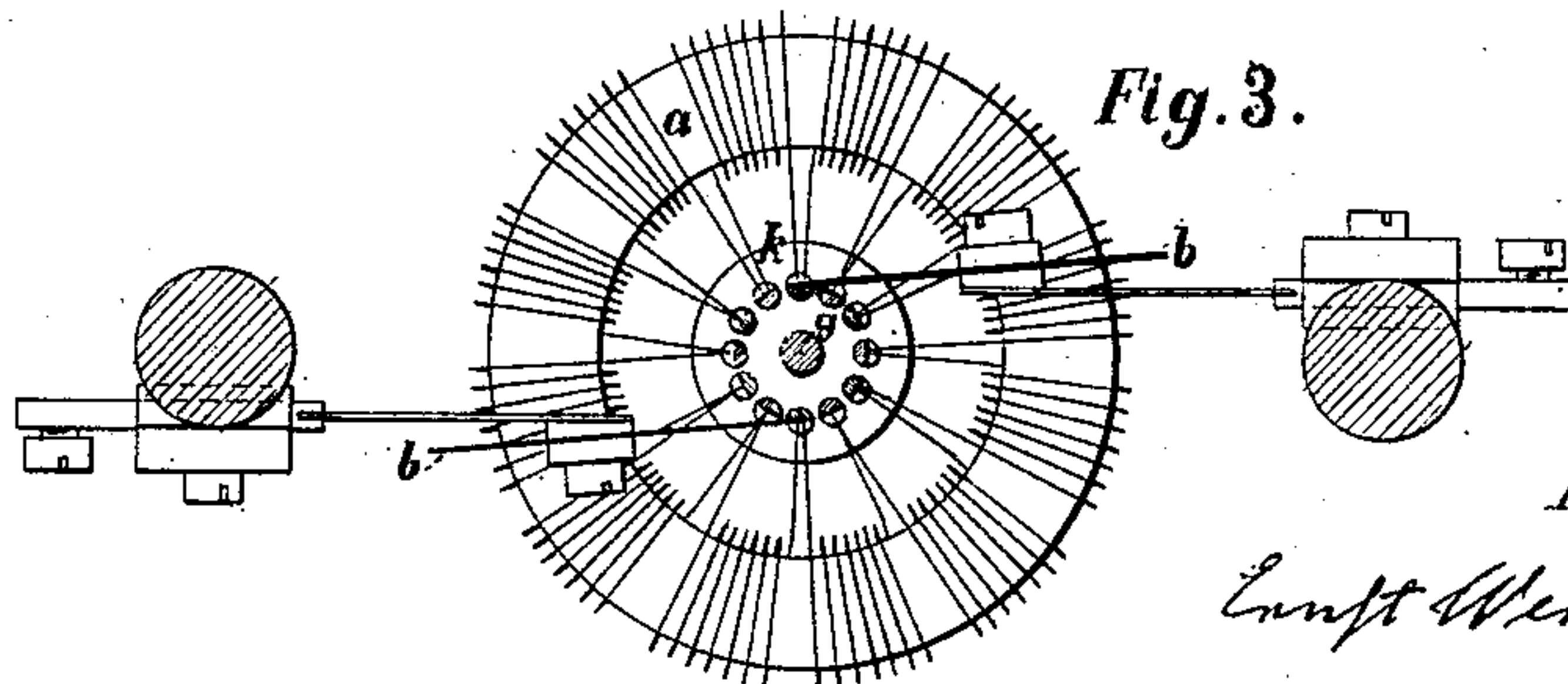


Fig. 3.

Witnesses:
Arthur Marks.

Inventor:
Eugene Werner Siemens

UNITED STATES PATENT OFFICE.

ERNST WERNER SIEMENS, OF BERLIN, GERMANY, ASSIGNOR TO SIEMENS & HALSKE, OF SAME PLACE.

ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 415,577, dated November 19, 1889.

Application filed December 2, 1887. Serial No. 256,807. (No model.) Patented in Germany September 6, 1887, No. 40,632.

To all whom it may concern:

Be it known that I, ERNST WERNER SIEMENS, a subject of the King of Prussia, German Emperor, and a resident of Berlin, in the Empire of Germany, have invented certain new and useful Improvements in Electric Meters, (for which I have obtained a patent in the German Empire, No. 40,632, dated September 6, 1887,) of which the following is a specification.

My invention relates to electric meters, and has for its object to provide a simple and serviceable means whereby the quantity of electricity passing over an electrical circuit in any given length of time may be determined and recorded.

My invention consists in the use of a dynamo-electric machine acting as a motor for a registering device and of a "damping" apparatus for retarding the motion thereof, whereby the current passing off the said circuit is indicated in ampère hours or such other unit as may be desired; and it also consists in the combination and arrangement of the parts thereof, as will be hereinafter fully described, and designated in the claims.

In the accompanying drawings, in which corresponding parts are designated by similar letters, Figure 1 is a longitudinal section of my invention. Fig. 2 is a cross-section on line *y y* thereof; and Fig. 3 is a detail of the armature, showing the arrangement of the commutator and brushes.

A magnet *d* has through its rear end a perforation *m*, through which passes a shaft *g*, the rear end of which registers with a mechanism *B*, such as is well known, for recording the number of revolutions of the said shaft. Upon the shaft near its forward end is mounted a so-called "Pacinotti ring-armature" *a*, provided with a commutator *k*, which revolves with the said shaft, which moves in bearings *A A* at the ends thereof. The position of the armature is so arranged as to be immediately in front of the poles of the magnet *d*, by which it is rotated. Surrounding the said magnet is an annular cylinder of paramagnetic metal *f*, which concentrates the magnetic field thereof. Inside of the said cylinder of paramagnetic metal

and surrounding the magnet is an annular cylinder of diamagnetic metal *l*, the said cylinder being attached to the shaft *g* and adapted to revolve therewith and with the armature *a*, mounted thereon.

Brushes *b b* bear upon the commutator and are attached to the circuit over which the current to be measured passes, or may form a part of the said circuit, as is desired.

The operation of my invention is as follows: The electric current passes from one of the brushes *b* through the commutator and armature to the other brush *b*, and in so doing excites the armature and causes it to revolve with a speed proportional to the strength of the current to be measured. This rotation would be extremely rapid and difficult to measure if means were not taken to retard or dampen it. These means consist of the use of the hereinbefore-described cylinder of diamagnetic metal *l*. By the rotation of the armature *a* the cylinder *l*, which I prefer to construct of copper, is moved around the magnet *d*, and electric currents are generated in the said cylinder, which tend to turn it in a direction opposite to that which causes them, and they therefore neutralize to a certain extent the action of the armature and reduce the speed of the shaft, and as the strength of these induced currents is proportional to the velocity of rotation of the cylinder they retard the revolution of the armature in proportion to the speed thereof. The speed of rotation of the armature for any current may be adjusted by moving the contact-brushes *b b* nearer to or farther from the neutral line of the magnet, as it is desired to decrease or increase the speed of the recording apparatus *B*, or in case of the brushes being fixed the magnet itself may be rotated in relation thereto.

Instead of using a Pacinotti ring-armature, a Von Hefner Alterneck Drum may take its place, or an electro-magnet excited by a constant source of electricity may be substituted for the permanent magnet shown in the drawings, or a separate magnet may be used to supply the magnetic field for the damping apparatus.

Having now described my invention, what I

claim, and desire to secure by Letters Patent, is—

1. In an electric meter, the combination of a magnet, an armature rotated in the magnetic field thereof by the current to be measured, a cylinder of diamagnetic metal rotated by the said armature about the magnet, and a stationary cylinder of paramagnetic metal surrounding the rotated cylinder of diamagnetic metal, as and for the purpose described.

2. In an electric meter, the combination of a magnet, a shaft, an armature mounted

thereon and rotated in the field of the said magnet by the current to be measured, a cylinder of diamagnetic metal, also mounted on the said shaft and revolving around the said magnet, and a stationary cylinder of paramagnetic metal surrounding the said rotating cylinder of diamagnetic metal, as and for the purpose described.

ERNST WERNER SIEMENS.

Witnesses:

B. ROI,
KARL BEILKE.