3 Sheets—Sheet 1.

B. F. CARD.

Meter for Measuring Electricity.

No. 223,112. Patented Dec. 30, 1879.

Fig. 1.

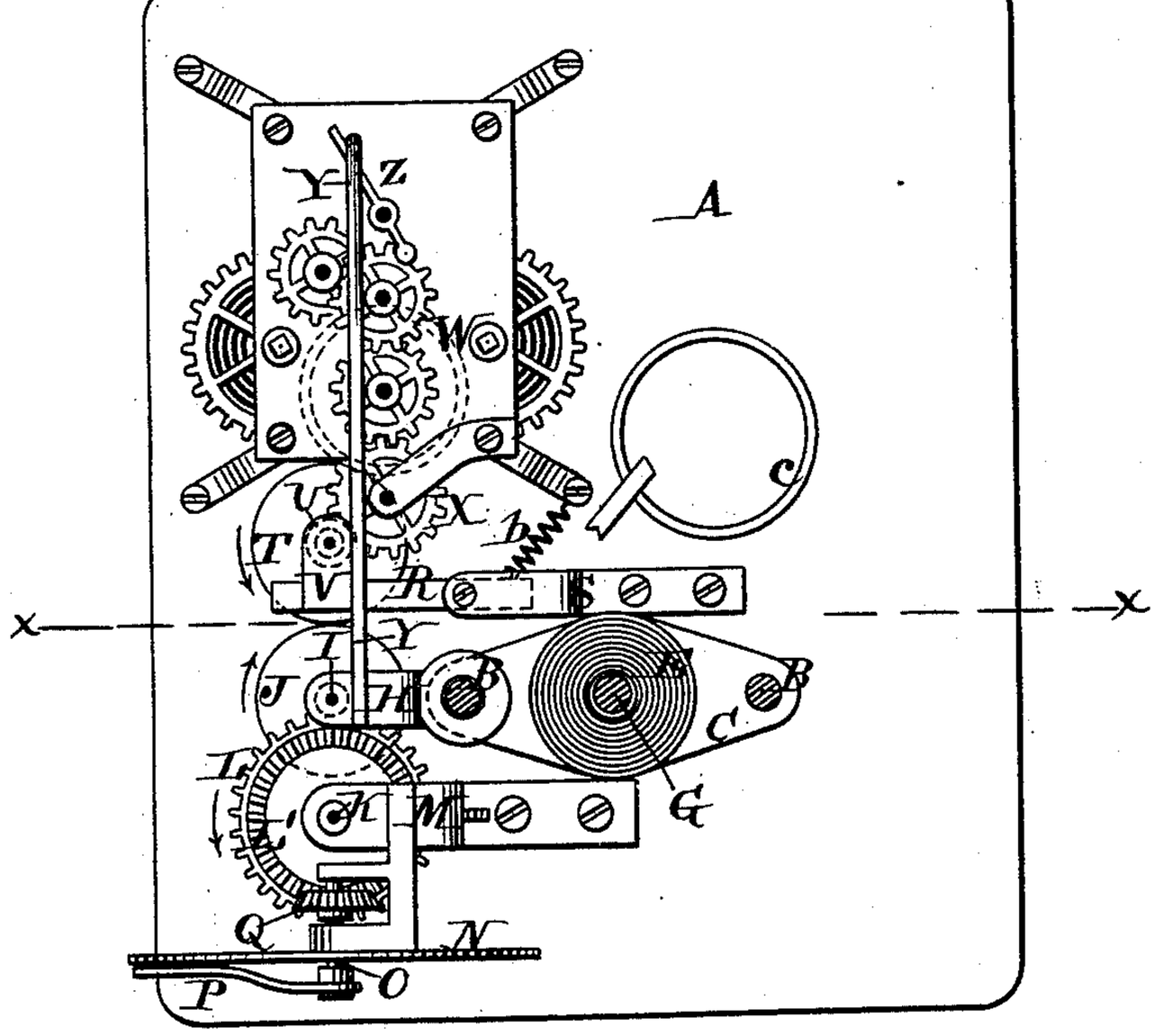
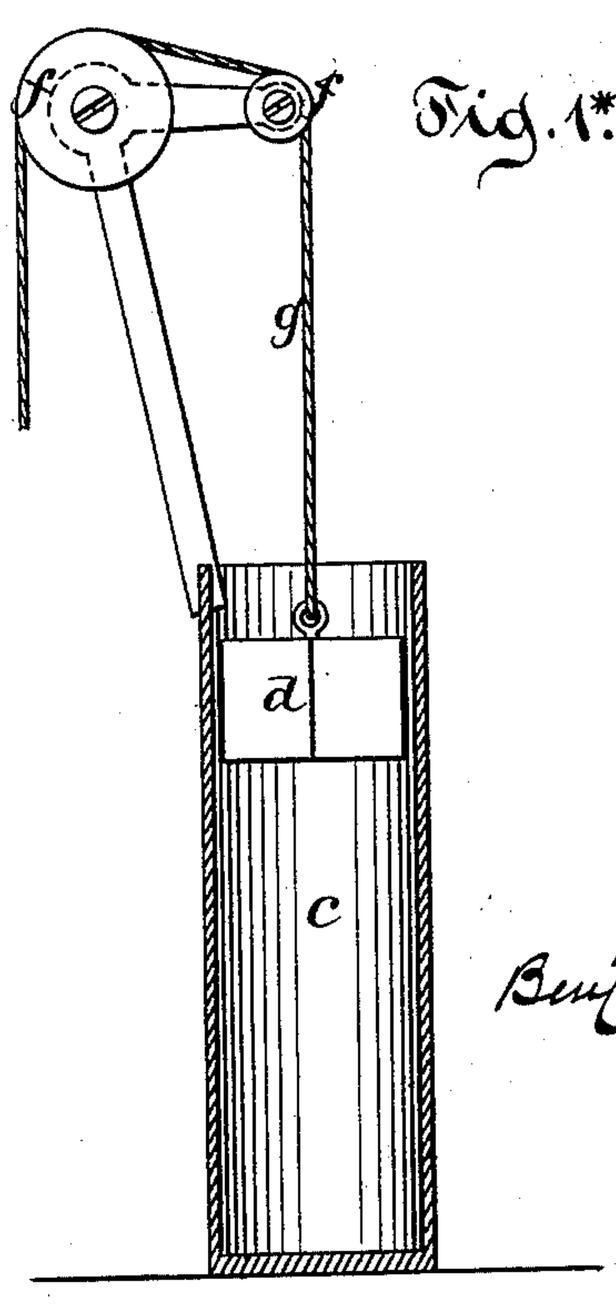


Fig. 1*.



Witnesses.
Louis W. Frost
James C. Smith

Inventor.
Benjamin F. Card

3 Sheets—Sheet 2.

B. F. CARD.

Meter for Measuring Electricity.

No. 223,112. Patented Dec. 30, 1879.

Fig. 2.

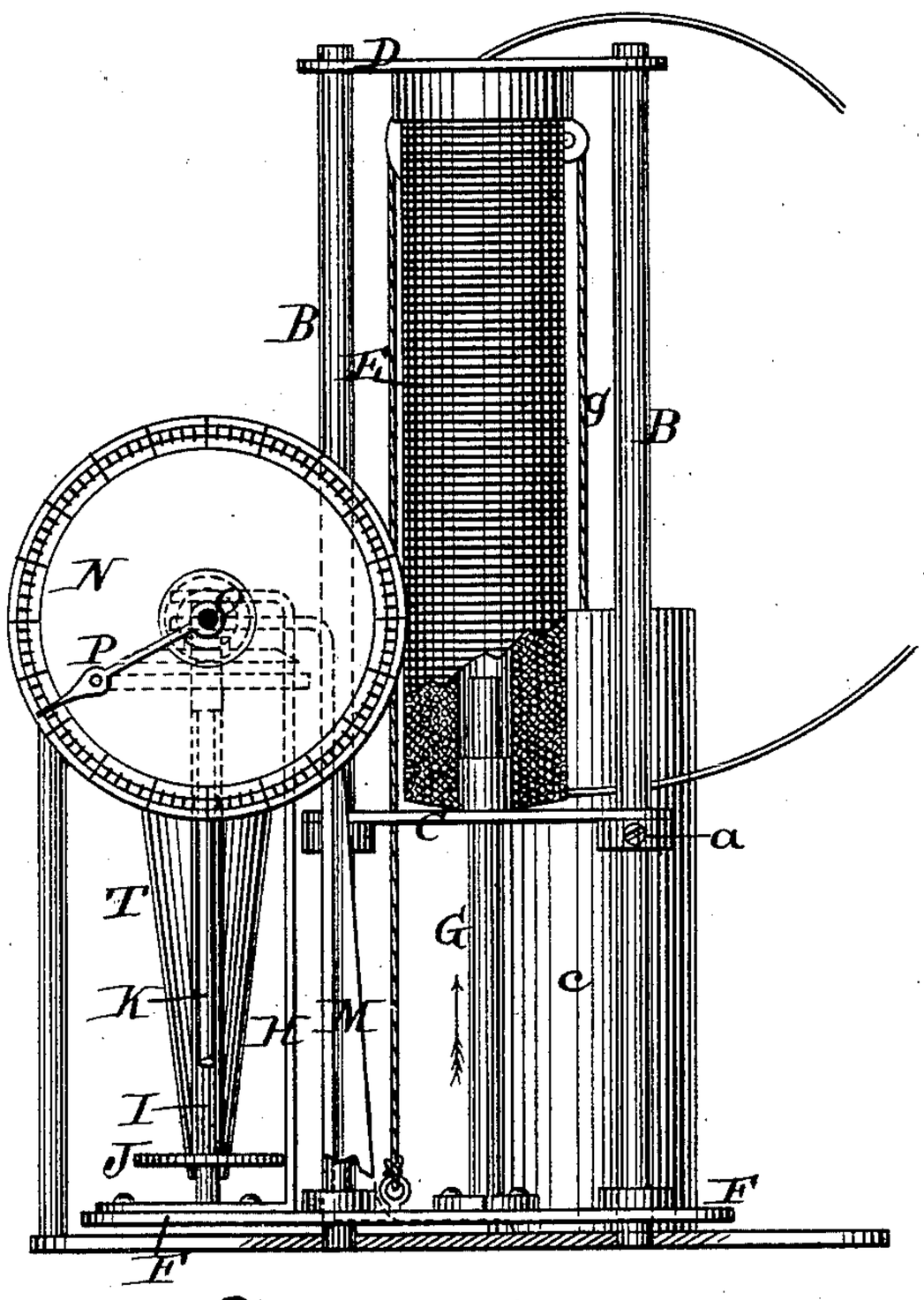
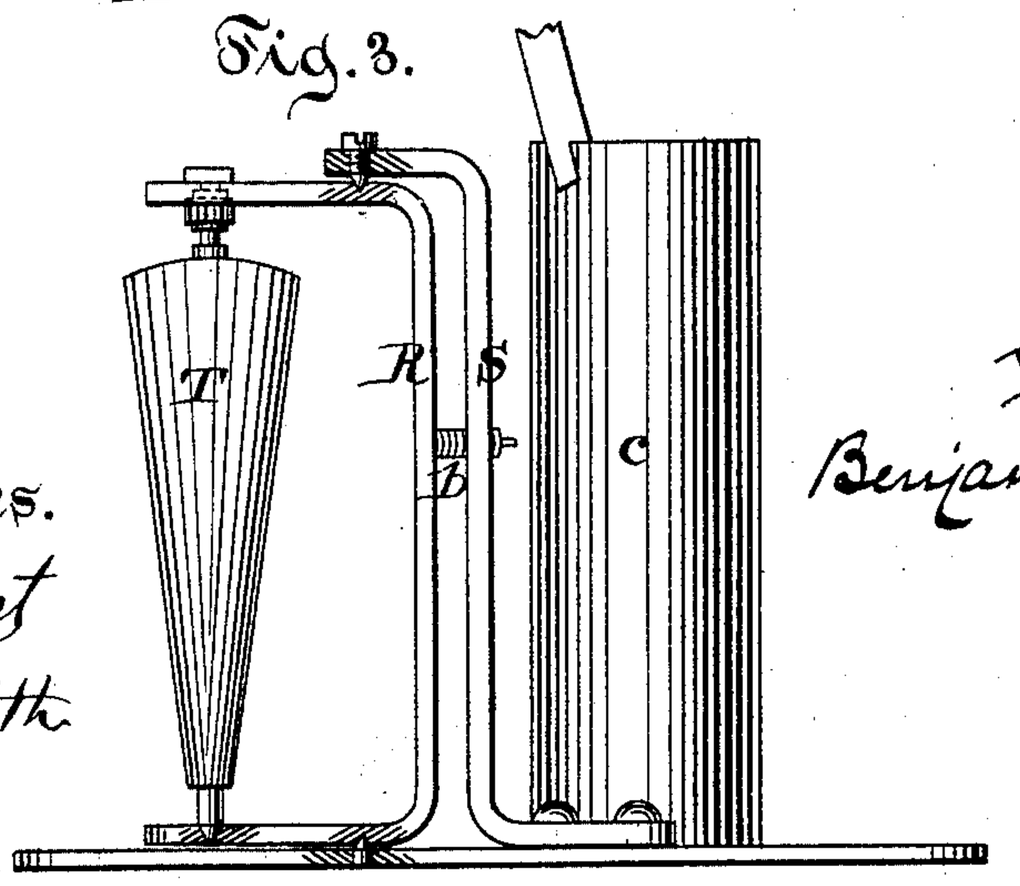


Fig. 3.



Witnesses.
Louis W. Frost
James C. Smith

Inventor.
Benjamin F. Card

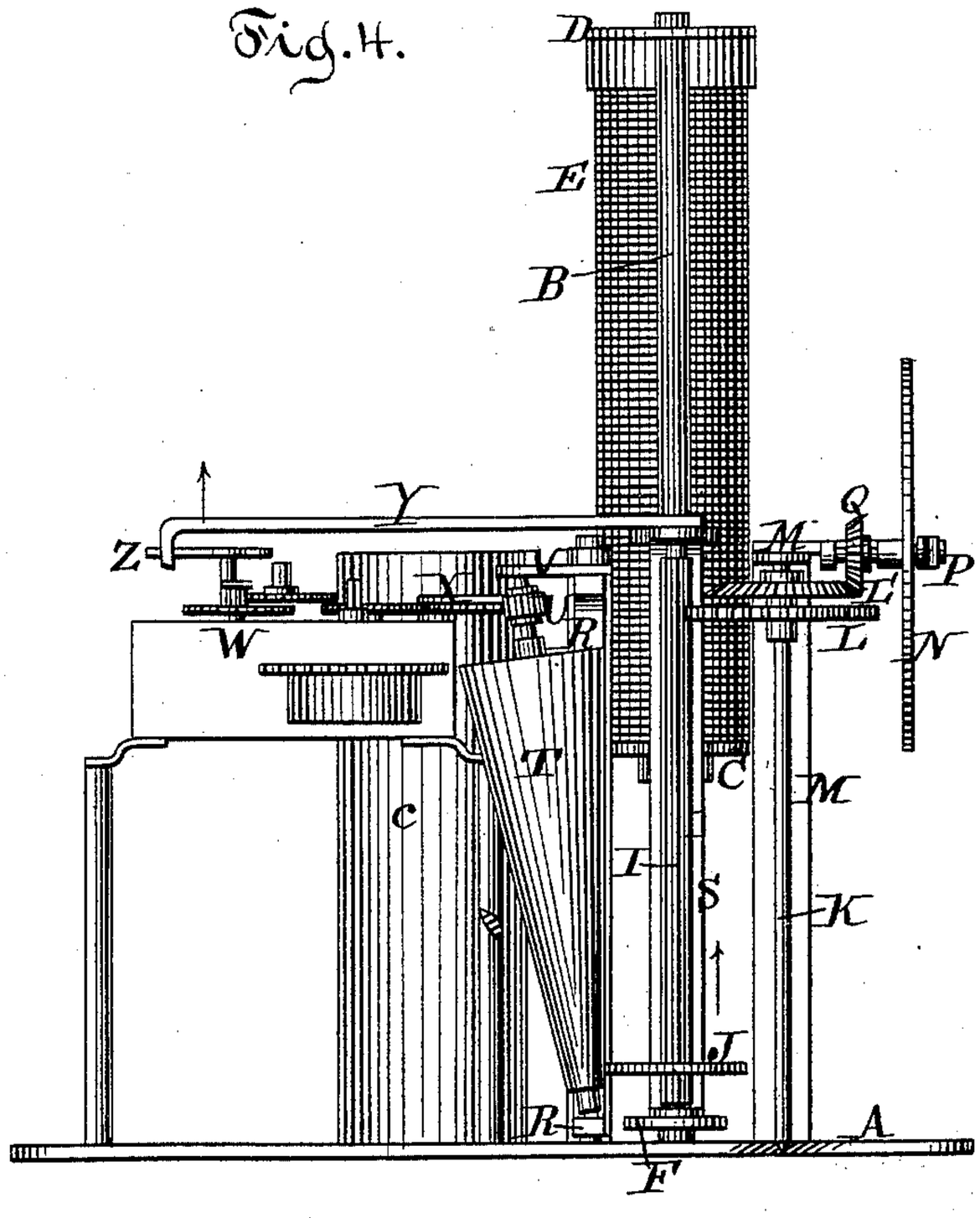
3 Sheets—Sheet 3.

B. F. CARD.

Meter for Measuring Electricity.

No. 223,112. Patented Dec. 30, 1879.

Fig. 4.



Witnesses.

Louis W. Frost

James C. Smith

Inventor.

Benjamin F. Card

UNITED STATES PATENT OFFICE.

BENJAMIN F. CARD, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN METERS FOR MEASURING ELECTRICITY.

Specification forming part of Letters Patent No. **223,112**, dated December 30, 1879; application filed December 14, 1878.

To all whom it may concern:

Be it known that I, BENJAMIN F. CARD, of the city of Brooklyn, county of Kings, and State of New York, have invented a new and useful Improvement in Electrometers, of which the following is a specification.

The object of my invention is to measure or determine the quantity or intensity of electricity by means of the mechanism hereinafter described.

The invention is based on the fact that a bar or rod of soft untempered iron placed within a helix through which a current of electricity is passed will be drawn within said helix by means of induction; and it consists of a helix and bar so arranged that, by means of induction, said bar will be drawn upward while the current is passing, and this motion of the bar, by means of mechanism hereinafter explained, causes the revolution of an index-arm over a measured scale, the speed of which is varied by the position in which a friction-wheel is brought in contact with a friction-cone, as will be more fully explained.

The construction and operation are as follows:

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 represents a plan or top view, partially in section. Fig. 1* shows the arrangement of the balance-weight. Fig. 2 is a front view, partially in section. Fig. 3 is a cross-section in the line X X, Fig. 1, showing the bearings of the cone. Fig. 4 is a side elevation of same.

Rigidly secured to the base-plate A are two metallic standards, B. Used in connection with these standards B are the two bridges C and D. The bridge C is made so as to slip over the standards, and to be placed at any required distance from the top of the standard, forming a shelf or rest for the helix E, and is adjusted and held in position by set-screws *a*.

In the center of bridge C is a hole, around which is soldered a hollow tube of same circumference as the core of the helix E, so that when the helix E is ready to be put in position it is slipped on over the tube. This tube holds the bottom of the helix E in position.

To the under side of bridge D is secured a ring of sufficient size to admit the upper part of the helix, so that when bridge D is placed in position on standards B the helix will be held firmly in position. In the top of bridge D is a hole that allows one end of the wire of helix E to pass through. (See Fig. 2.) Sliding on the standards B is a metallic plate, F, on the upper surface of which rests the iron bar G, which is made of soft untempered iron, and does not become permanently magnetized, the upper end of which is brought into and slides within the helix E. On the lower end of bar G is formed a collar, which is loosely fitted into a piece of insulating material, which is rigidly secured to the metallic plate F. Also secured to the metallic plate F is the knee-piece H, which holds the vertical grooved shaft I, to which is secured the friction-wheel J.

Journaled in the base-plate A is the vertical shaft K, on the upper end of which are rigidly secured the gear-wheels L and L′. The upper end of vertical shaft K is journaled in the knee-piece M, attached to the base-plate A.

The dial-plate N is rigidly secured to the knee-piece M. Passing through this dial-plate is the shaft O, at one end of which is attached the hand P. On the other end is the gear-wheel Q, which is actuated by the gear-wheel L′. The shaft O is journaled to the knee-piece M. (See Figs. 1, 2, and 4.)

Placed in yoke R, which is supported by the knee-piece S, secured to base-plate A, is a friction-cone, T, set in such a position that one of its sides will be parallel to the grooved shaft I, and so that the friction-wheel J shall have an equal bearing in whatever position it may come in contact with friction-cone T. This friction-wheel J, being carried by the plate F, partakes of the motion of said plate F, and hence the friction-wheel J is brought in contact with a different portion of the friction-cone T accordingly as the intensity of the electric current varies.

The shaft of the lower end of the friction-cone T has its bearing in the yoke R, and the upper end of the shaft of said friction-cone T has a gear-wheel, U, the end of the shaft having its bearing in a metallic piece, V, attached to the yoke R. (See Figs. 3 and 4.)

Secured to the base-plate A are four standards, upon which is mounted and properly se-

cured the train of wheels W, and so arranged that the gear-wheel X shall engage and actuate the gear-wheel U of the friction-cone T.

Secured to the knee-piece H is the rod Y, having its outer end crooked or bent downward sufficient to come in contact with the revolving arm Z, and performing the functions of a stop. (See Figs. 1 and 4.) The spring *b*, one portion of which is attached to the yoke R and the other end to one of the standards that support the train of wheels, serves to hold the friction-cone in place and equalize its bearing.

Secured to the base-plate A is a tube, C, of sufficient size and depth to form a receptacle for the balance-weight *d*.

Secured to the upper side of receptacle C is an upright rod, having an arm holding two pulleys, *f*, over which a cord, *g*, is passed, one end of which is secured to metallic plate F, the other end to weights *d*. (See Fig. 1*.)

The operation of my electrometer is as follows: When a current of electricity is passed through the helix E the iron bar G is instantly magnetized, so that it is drawn up into the helix E, as shown by the arrow in Fig. 2. This action, in connection with the weight *d*, causes the metallic plate F, with the attachments, to be raised up, at the same time releasing the rod Y from contact with the revolving arm Z, which revolves the train of wheels W, thus actuating the gear-wheel U of the friction-cone T, which is brought closely in contact with the friction-wheel J on grooved shaft I, imparting a steady and positive motion to the gear-wheels L and L′, and which in turn imparts motion to the gear-wheel Q, causing the hand P to revolve, giving a positive indication on the dial-plate N of the amount or intensity of the electric current passing.

In the example shown the train of wheels are operated by the actions of things; but I do not wish to be understood as limiting myself to the use of a train of wheels like W. I may use any other motor, such as weights or like devices, or electro-motive power.

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

1. The method of measuring the quantity of electric current by causing the same to pass through a helix, and thereby operating a movable bar of iron, said bar of iron being connected to any suitable mechanism moving an index or measuring-arm at each moment with a velocity to correspond with the intensity of the current, said mechanism being actuated or put in motion by the movement of said bar, substantially as described, and for the purpose set forth.

2. In an electrometer, the combination of the helix E, the movable bar G, metallic piece F and its attachments, and cone T, gear-wheel U, and grooved shaft I with gear-wheels L and L′, actuating, by means of the movement of the rod Y, train of wheels or other mechanism for obtaining a regular motion or revolution of the cone T, and, by means of the friction-wheel J on the grooved shaft I, transmitting said motion to a suitable index mechanism, substantially as described, and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 12th day of December, A. D. 1878.

BENJAMIN F. CARD.

In presence of—
LOUIS W. FROST,
A. J. KENNEY.