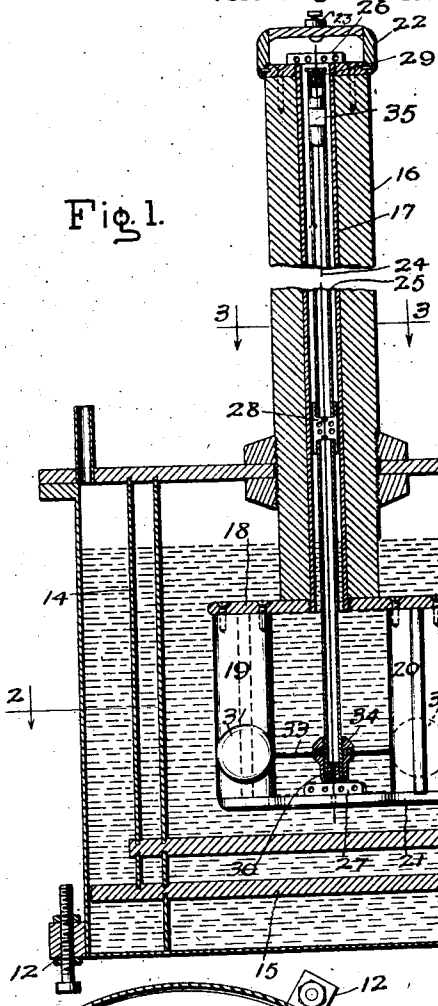
Aug. 25, 1925. 1,551,374

W. P. DAVEY

ELECTROSTATIC VOLTMETER

Filed Aug. 24, 1923

Fig. 1.



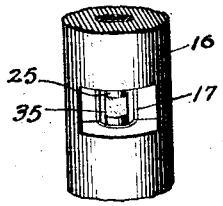


Fig. 4.

Fig. 2.

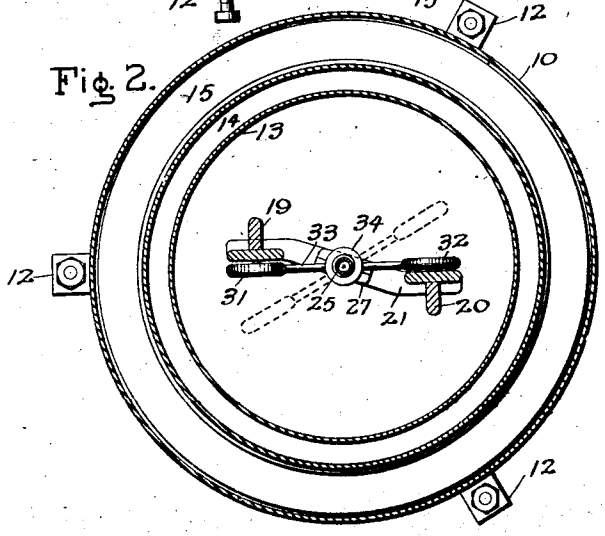
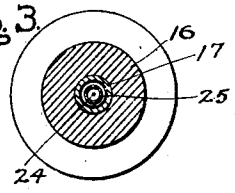


Fig. 3.



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by Alexander S. Lamb.
His Attorney.

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UNITED STATES PATENT OFFICE.

WHEELER P. DAVEY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTROSTATIC VOLTMETER.

Application filed August 24, 1923. Serial No. 659,239.

To all whom it may concern:

Be it known that I, WHEELER P. DAVEY, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electrostatic Voltmeters, of which the following is a specification.

My invention relates to electrostatic voltmeters and has for its object the provision of a simple and inexpensive instrument of its class capable of measuring high potentials of either direct or alternating current with accuracy. In carrying my invention into effect, I provide cooperating movable and stationary elements arranged to be subjected simultaneously to the potential under investigation and to create by means of a repulsive action between them, a movement which is proportional to the applied potential, together with suitable housing and means for indicating the extent of movement.

The features of my invention which I believe to be novel and patentable will be pointed out in the claims appended hereto. A preferred modification of my invention will now be described in connection with the accompanying drawings in which Fig. 1 represents a vertical cross section through an instrument built in accordance with my invention; Fig. 2 a horizontal section taken on line 2—2 of Fig. 1; Fig. 3 a horizontal section taken on line 3—3 of Fig. 1, and Fig. 4 an exterior view of the indicating part of the instrument. Referring to the drawings, in which like parts are designated by like numerals throughout, 10 indicates a suitable cylindrical tank provided with a cover 11 of insulating material such as wood, fiber or hard rubber. The tank is preferably provided with leveling screws 12. The tank 10 contains an insulating fluid such as oil and is provided with suitable baffles 13, 14 and 15 to prevent disturbing circulating currents in the insulating fluid. Vertically supported by the cover 11 is a relatively thick cylinder 16 preferably made of wood or other suitable material extending into the oil tank and above the cover. A brass tube 17 fits snugly within the wooden cylinder 16 and is provided with threaded ends adjacent the ends of cylinder 16. On the lower end of tube 17 and immersed in the insulating oil contained within tank 10 is secured a metallic cross piece 18 which abuts against the lower end of cylinder 16. This cross piece supports two vertical, stationary electrodes 19 and 20 equally spaced with respect to the center line of the apparatus. A supporting cross piece 21 joins the lower ends of the two electrodes. The cross piece 21 and the electrodes 19 and 20 are given the form shown in Fig. 2 and are made of conducting material, such as brass.

To the top of tube 17 is secured a metallic cap 22 securely holding the tube 17 and cylinder 16 together. This cap is provided with a terminal 23 for attaching the conductor which is subjected to the potential to be measured.

Torsionally suspended within tube 17 by means of a central wire 24 is a smaller tube 25 preferably made of brass. The wire 24 is secured in suitable clamps 26 and 27 in cap 22 and on cross piece 21 respectively. Tube 25 is rigidly secured to the torsional wire only near its center by means of a suitable clamp 28. The tube 25 and the parts carried thereby are held in proper alinement by guides 29 and 30 in the top and bottom ends respectively of the tube 25. The torsional wire 24 passes freely through these guides. Within the oil chamber and adjacent the stationary electrode, tube 25 carries a pair of electrodes 31 and 32 secured to the tube by means of arm 33 and bushing 34 all made of conducting material, such as brass.

The torsional system is initially adjusted so that the movable and stationary electrodes stand in the relation shown in full lines in Fig. 2. Near the top of the instrument, cylinder 16 and tube 17 have portions cut away as indicated in Fig. 4 in order that an indicating device here illustrated as a mirror 35, attached to cylinder 25, may be seen and any torsional movement of the system indicated. When a mirror is used as the indicating device, the well known method of reflecting a beam of light on to a suitable stationary scale will be utilized. If a pointer is used, it will be attached to the cylinder 25 in place of, or in addition to, the mirror and will cooperate directly with a suitable stationary scale, not shown.

My instrument operates on the principle of the well known gold-leaf electroscope. It will be noted that when potential is applied to terminal 23, both the stationary and movable electrodes will be equally charged there-

by since both are electrically connected to terminal 23 through the metallic parts of the instrument. It will thus be evident that when potential is applied, a repelling force will be set up between the movable and stationary electrodes, which force will be increased as the applied potential is increased, causing a substantially proportional torsional movement of the system as indicated in dotted lines in Fig. 2. A corresponding deflection of the indicating device which is rigidly attached to the movable electrode will result.

All parts of the instrument subjected to the applied potential are surrounded by liberally curved surfaces so that corona discharges are minimized. All interior parts of the instrument are subjected to the same potential so that there is no need of insulating various circuits from each other. After the device is adjusted and calibrated, the operator need not touch the instrument and consequently there is little danger from exposure to high potentials. When it is desired to measure the potential between two circuits, one line is attached to the case and the other to the terminal 23. For measuring potentials above ground, the case will be grounded.

I have found that this instrument will measure either alternating current or direct current potentials between 25 and 100 kilovolts with an error not exceeding 125 volts.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. An electrostatic voltmeter comprising a tank, an insulating fluid in said tank, a pair of diametrically disposed electrodes immersed in said fluid, a vertical tube centrally disposed with respect to said electrodes, an electric terminal on the upper end of said tube exterior of said tank, said tube being connected to said electrodes, a pair of movable electrodes torsionally suspended on the center line of said tube and cooperating with said stationary electrodes, a torsional suspension passing through said tube and electrically connecting said movable electrodes with said terminal and an indicator rigidly attached with said movable electrodes and mounted above said tank for indicating the position of said movable electrode.

2. In a measuring instrument, a vertically, torsionally suspended movable element adapted to be subjected to high potentials and to have a portion thereof immersed in an insulating fluid comprising a torsional wire, a tube of sufficient diameter to prevent excessive corona discharges when subjected to high potential surrounding said wire and rigidly secured thereto near its center, guides carried in the end of said tube through which said wire freely passes, a movable electrode rigidly secured to the lower portion of said tube and an indicating element rigidly secured to the upper portion of said tube.

In witness whereof, I have hereunto set my hand this 23rd day of August, 1923.

WHEELER P. DAVEY.