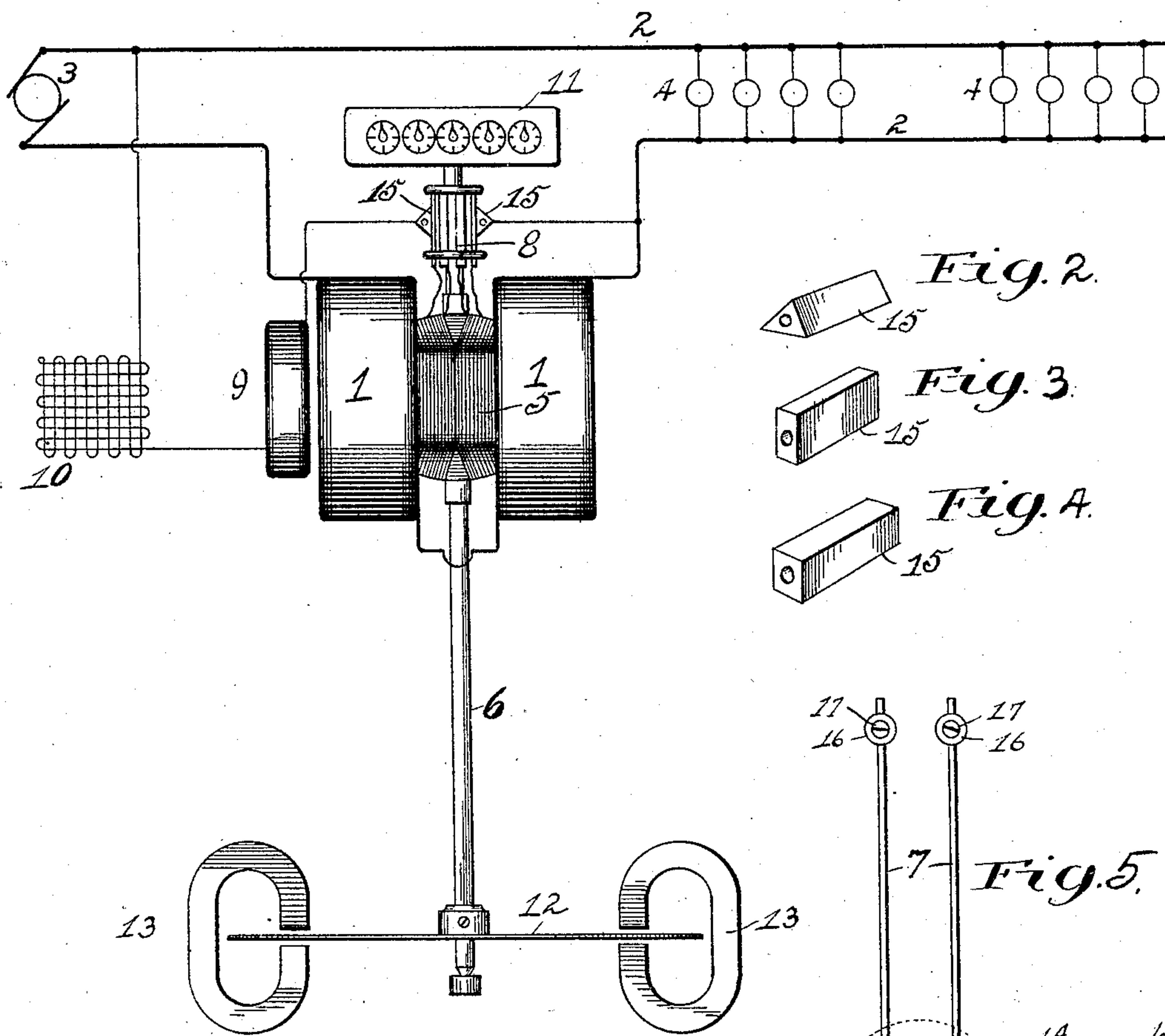
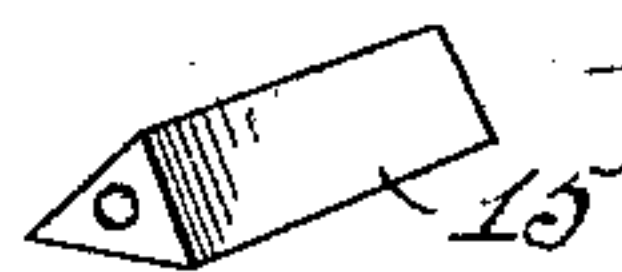


T. DUNCAN.  
ELECTRIC METER.  
APPLICATION FILED JULY 13, 1904.

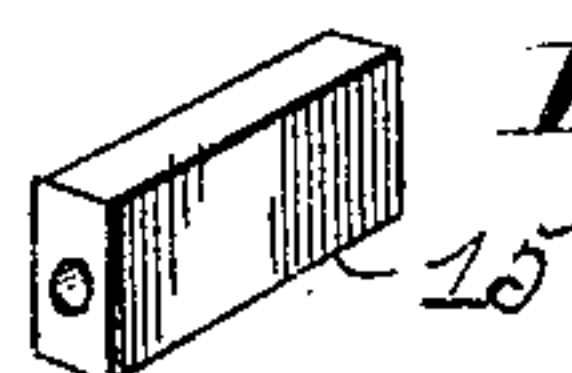
*Fig. 1.*



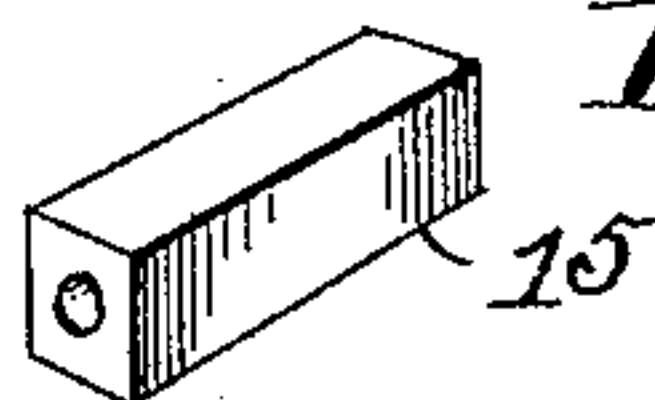
*Fig. 2.*



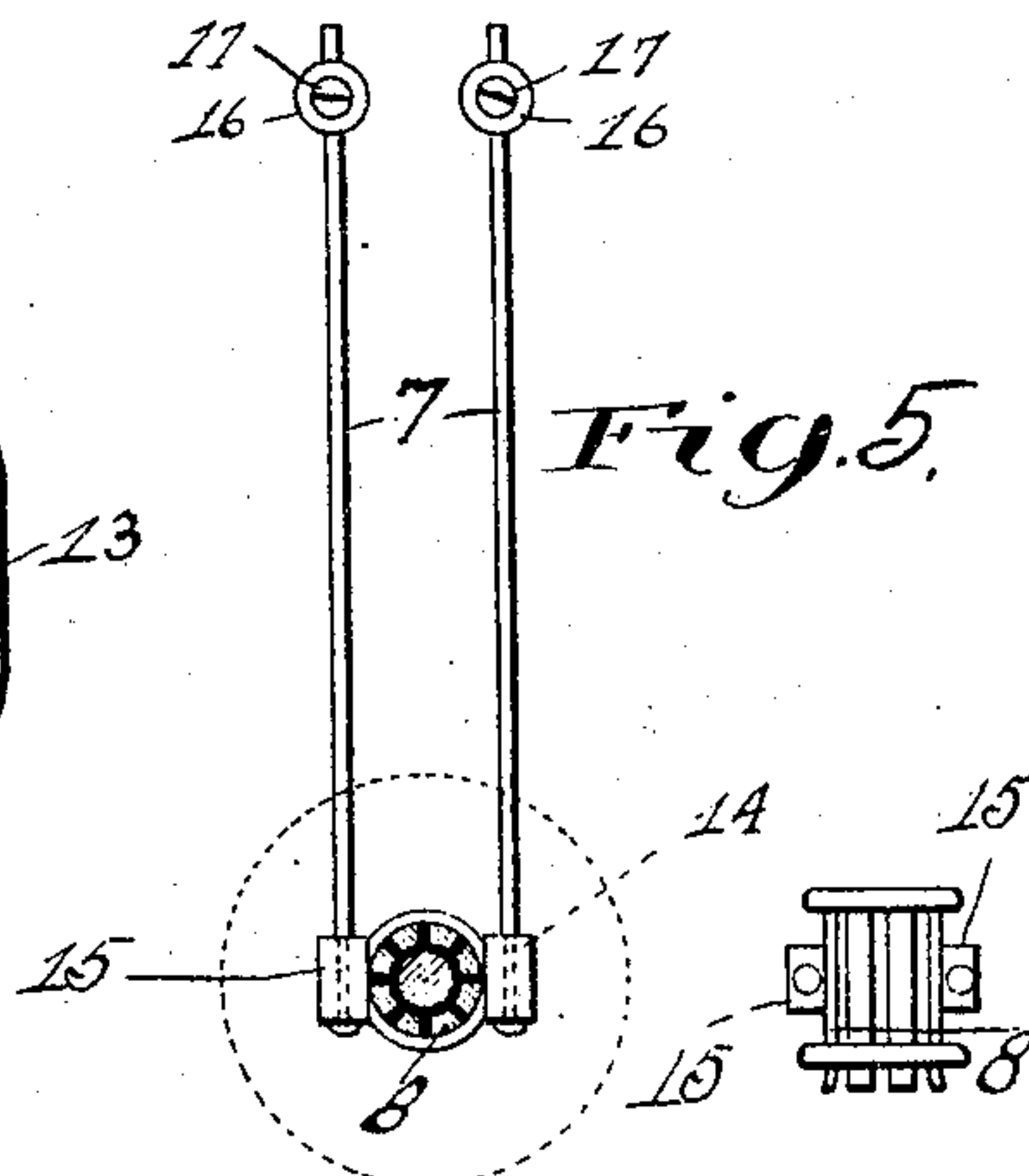
*Fig. 3.*



*Fig. 4.*

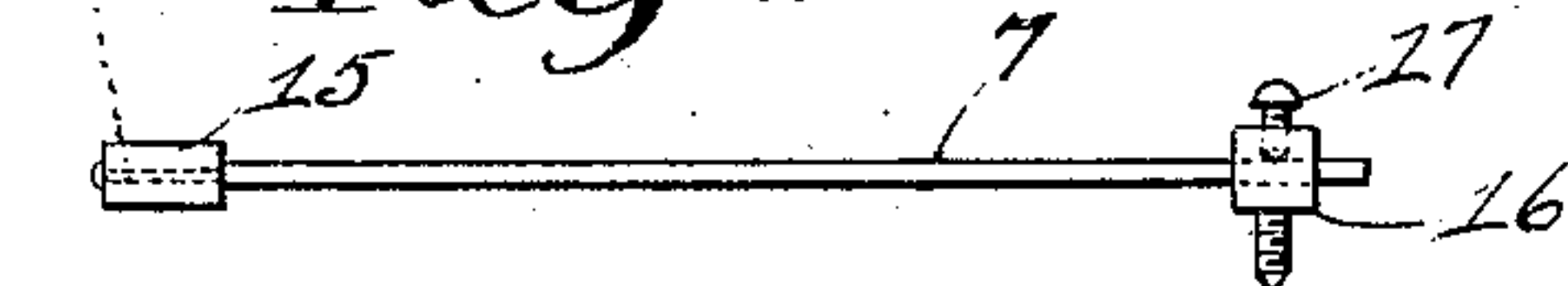


*Fig. 5.*

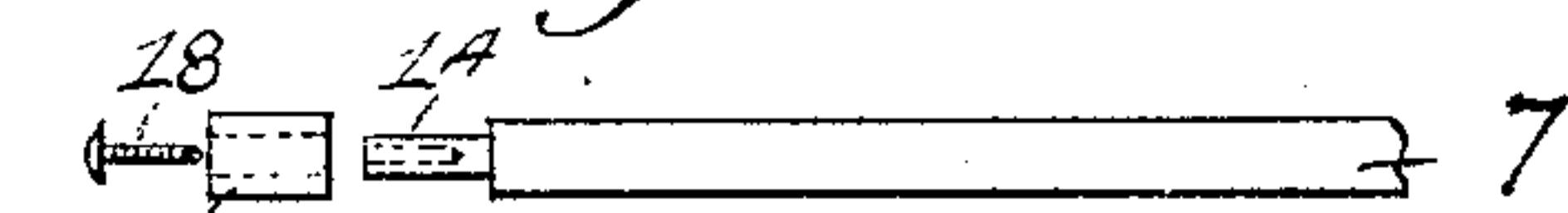


*Fig. 6.*

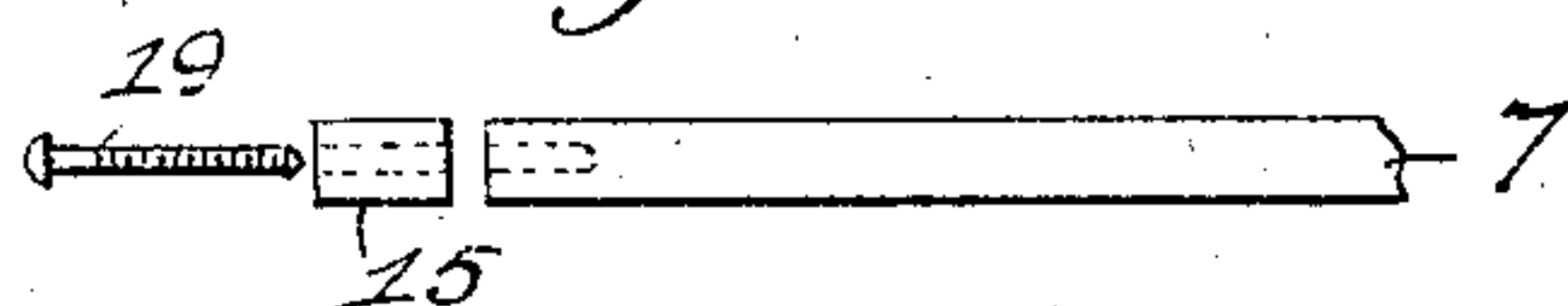
*Fig. 7.*



*Fig. 8.*



*Fig. 9.*



Witnesses:-  
Carl A. Crawford  
Leon Strohm

Inventor  
Thomas Duncan  
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his Attorney



# UNITED STATES PATENT OFFICE.

THOMAS DUNCAN, OF LAFAYETTE, INDIANA.

## ELECTRIC METER.

No. 796,069.

Specification of Letters Patent.

Patented Aug. 1, 1905.

Application filed July 13, 1904. Serial No. 216,323.

*To all whom it may concern:*

Be it known that I, THOMAS DUNCAN, a citizen of the United States, residing at Lafayette, 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 motor-meters employing collecting devices including brushes, and finds wide application in connection with wattmeters of the commutated type, and has for its object the provision of an improved brush construction whereby the care and repair of the brush-tips may be reduced to a minimum. As is well known, a great deal of injury is occasioned the brush-tips by reason of the sparking between the same and the commutators arising upon the wear of the brushes, it being necessary on occasion to file off or otherwise smooth down the surfaces of the brush-tips in order to have the meter resume its original accuracy and cease sparking. This repair of the brushes has to be very correctly done requiring the services of an expert, on which account many users of meters are compelled to return their meters to the factory, occasioning considerable expense and delay. In the device of my present invention it is only necessary to clean the commutator with worn crocus cloth in the ordinary manner as recommended by manufacturers, for I have provided a brush construction including a tip which may be shifted in position with respect to the brush and the commutator so that a new wearing-surface may be presented to the commutator. The tip upon the brush is so mounted upon the brush that it will remain in a position in which it is placed, so that new wearing-surfaces may be presented to the commutator. These brush-tips are preferably of polyhedral formation, brush-tips that are triangular, rectangular, or square answering well the purpose, though I do not wish to be limited to these shapes. These brush elements are desirably mounted to rotate upon axes that are transverse to the axis of the commutator, the brush-arms being desirably formed to have as structural parts thereof journal elements upon which the brush-tips are adapted to rotate for the purpose stated.

I will explain my invention more fully by

reference to the accompanying drawings, in which—

Figure 1 is a view in elevation of an integrating wattmeter with electrical connections therefor diagrammatically shown. Fig. 2 is a perspective view of one form of brush-tip. Fig. 3 is a view of another form of brush-tip. Fig. 4 is a view of still another form of brush-tip. Fig. 5 is a plan view of a portion of the structure illustrated in Fig. 1. Fig. 6 is a front elevation showing a different form of brush-tip than that shown in Fig. 1. Fig. 7 is a side elevation illustrating one mounting of brush-tip and brush. Fig. 8 is a side elevation illustrating another brush-tip mounting. Fig. 9 is another side elevation illustrating still another brush-tip mounting.

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

The meter or measuring instrument illustrated has a current or series field-winding subdivided into coils 1 1, that are included in series with one of the mains 2, that are supplied from a source of direct current 3, translating devices, as lamps 4, being illustrated as a load for the circuit. The winding 5 is subdivided into coils that are mounted upon a spindle 6 and which are included in bridge of the supply-mains 2 by commutator-brushes 7 engaging a commutator 8, that is connected with the coils of the winding 5, the windings 1 and 5 co-operating to produce a wattmeter. A friction compensating coil 9 is provided in series with the armature-coils and in series with extraneous artificial resistance 10. The instrument being a recording instrument, a counter 11 is shown as being adapted for operation by the shaft 6. A damping-disk 12 is provided upon the lower end of the spindle and rotates within a permanent magnetic field, that may be furnished by the magnets 13. The commutator-brushes 7 may have the major portion of their lengths formed of wire or strip metal, preferably of sufficient resiliency to enable the brushes to exert requisite pressure upon the commutator.

In the construction shown in Figs. 5 and 7 the brush-arms are provided with reductions 14, upon which the brush-tips 15 are journaled, these reduced ends 14 being rivet-headed to prevent the brush-tips from slipping off. The brush-arms may be provided with any suitable block mounting 16, having a clamping-screw 17 for holding the same in position.



In the construction shown in Fig. 8 the journal 14 is of larger diameter to receive a screw 18, whose head holds the block or tip 15 in place.

In the construction shown in Fig. 9 there is no reduction 14, the brush tip or block 15 being held against the end of the companion portion of the brush by a screw 19, the brush tip or block having the hole through which the screw passes unthreaded, so that it may rotate freely upon the screw. The material of which the brush-tips are made is preferably silver, and the balance of the brush which supports the brush-tips is preferably made of phosphor-bronze, though the material of which the brush elements are made is not essential to a realization of the invention. It will be apparent with what ease a free brush-surface will be brought into engagement with the commutator, which may be done by any one skilled or unskilled in meter adjustment.

I shall in the claims speak of the brush elements carrying the tips as the "stems." While I have shown specific ways for mounting the tips upon these stems, whereby said tips are provided with axes of rotation transverse to the axis of rotation of the meter-shaft and commutator, I do not wish to be limited to the precise constructions illustrated; nor do I wish to be limited to the particular angle at which the axes of rotation of the brush-tips are disposed transversely to the axis of the commutator and shaft or spindle, though I prefer to have the axes of the brush-tips at right angles to the axis of the commutator. The axes of rotation of the blocks are generally parallel to the directions of the brush-stems.

I believe it to be new with me to provide brush elements, as the blocks 15, that are rotatably mounted in bearings, whether said blocks or brush elements are mounted upon brush-stems or not.

I do not wish to be limited to a polyhedral formation of the brush-tips, nor to any particular number of surfaces in a multisurfaced brush-tip; nor do I wish to be limited to other specific characteristics of constructions illustrated, which may be modified without departing from the spirit of my invention; but,

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

1. A meter including a brush element formed of a stem and a tip adjustable with respect to the same whereby a new tip-surface may be brought into contact, the tip and stem extending in the same direction, substantially as described.

2. A meter including a brush element formed of a stem and a tip adjustable with respect to the same whereby a new tip-surface may be brought into contact, said tip having an axis of rotation transverse to the axis of rotation of the meter-spindle, substantially as described.

3. A meter including a brush element formed of a stem and a tip adjustable with respect to the same whereby a new tip-surface may be brought into contact, said tip having an axis of rotation at right angles to the axis of rotation of the meter-spindle, substantially as described.

4. A meter including a brush element formed of a stem and a tip of polyhedral formation adjustable with respect to the same whereby a new tip-surface may be brought into contact, the tip and stem extending in the same direction, substantially as described.

5. A meter including a brush element formed of a stem and a tip of polyhedral formation adjustable with respect to the same whereby a new tip-surface may be brought into contact, said tip having an axis of rotation transverse to the axis of rotation of the meter-spindle, substantially as described.

6. A meter including a brush element formed of a stem and a tip of polyhedral formation adjustable with respect to the same whereby a new tip-surface may be brought into contact, said tip having an axis of rotation at right angles to the axis of rotation of the meter-spindle, substantially as described.

7. A meter including a commutator for its armature, brushes engaging said commutator, each brush being formed of a stem and a tip adjustable with respect to the same whereby a new tip-surface may be brought into contact with the commutator, the tip and stem extending in the same direction, substantially as described.

8. A meter including a commutator for its armature, brushes engaging said commutator, each brush being formed of a stem and a tip adjustable with respect to the same whereby a new tip-surface may be brought into contact with the commutator, said tip having an axis of rotation transverse to the axis of rotation of the meter-spindle, substantially as described.

9. A meter including a commutator for its armature, brushes engaging said commutator, each brush being formed of a stem and a tip adjustable with respect to the same whereby a new tip-surface may be brought into contact with the commutator, said tip having an axis of rotation at right angles to the axis of rotation of the meter-spindle, substantially as described.

10. A meter including a commutator for its armature, brushes engaging said commutator, each brush being formed of a stem and a tip of polyhedral formation adjustable with respect to the same whereby a new tip-surface may be brought into contact with the commutator, the tip and stem extending in the same direction, substantially as described.

11. A meter including a commutator for its armature, brushes engaging said commutator, each brush being formed of a stem and a tip of polyhedral formation adjustable with re-



spect to the same whereby a new tip-surface may be brought into contact with the commutator, said tip having an axis of rotation transverse to the axis of rotation of the meter-spindle, substantially as described.

12. A meter including a commutator for its armature, brushes engaging said commutator, each brush being formed of a stem and a tip of polyhedral formation adjustable with respect to the same whereby a new tip-surface may be brought in contact with the commutator, said tip having an axis of rotation at right angles to the axis of rotation of the meter-spindle, substantially as described.

13. A meter including a brush element having a mounting permitting said element to be rotated to present a new surface, and a stem for the brush element, the axis of rotation of said element being substantially parallel in direction to the stem, substantially as described.

14. A commutated meter including brush elements each provided with mountings permitting said brush elements to be rotated to present new surfaces to the commutator of

the meter, and a stem for the brush element, the axis of rotation of said element being substantially parallel in direction to the stem, substantially as described.

15. A meter including a brush element having a mounting permitting said element to be rotated to present a new surface, the axis of rotation afforded by the brush-element mounting being transverse to the axis of rotation of the meter spindle or shaft, substantially as described.

16. A commutated meter including brush elements each provided with mountings permitting said brush elements to be rotated to present new surfaces to the commutator of the meter, the axes of rotation afforded by the brush-element mountings being transverse to the axis of rotation of the meter spindle or shaft, substantially as described.

In witness whereof I hereunto subscribe my name this 8th day of July, A. D. 1904.

THOMAS DUNCAN.

Witnesses:

MARSHALL F. HOLMES,  
GEORGE L. CRAGG.