G. E. STEVENS.

ELECTRIC METER.

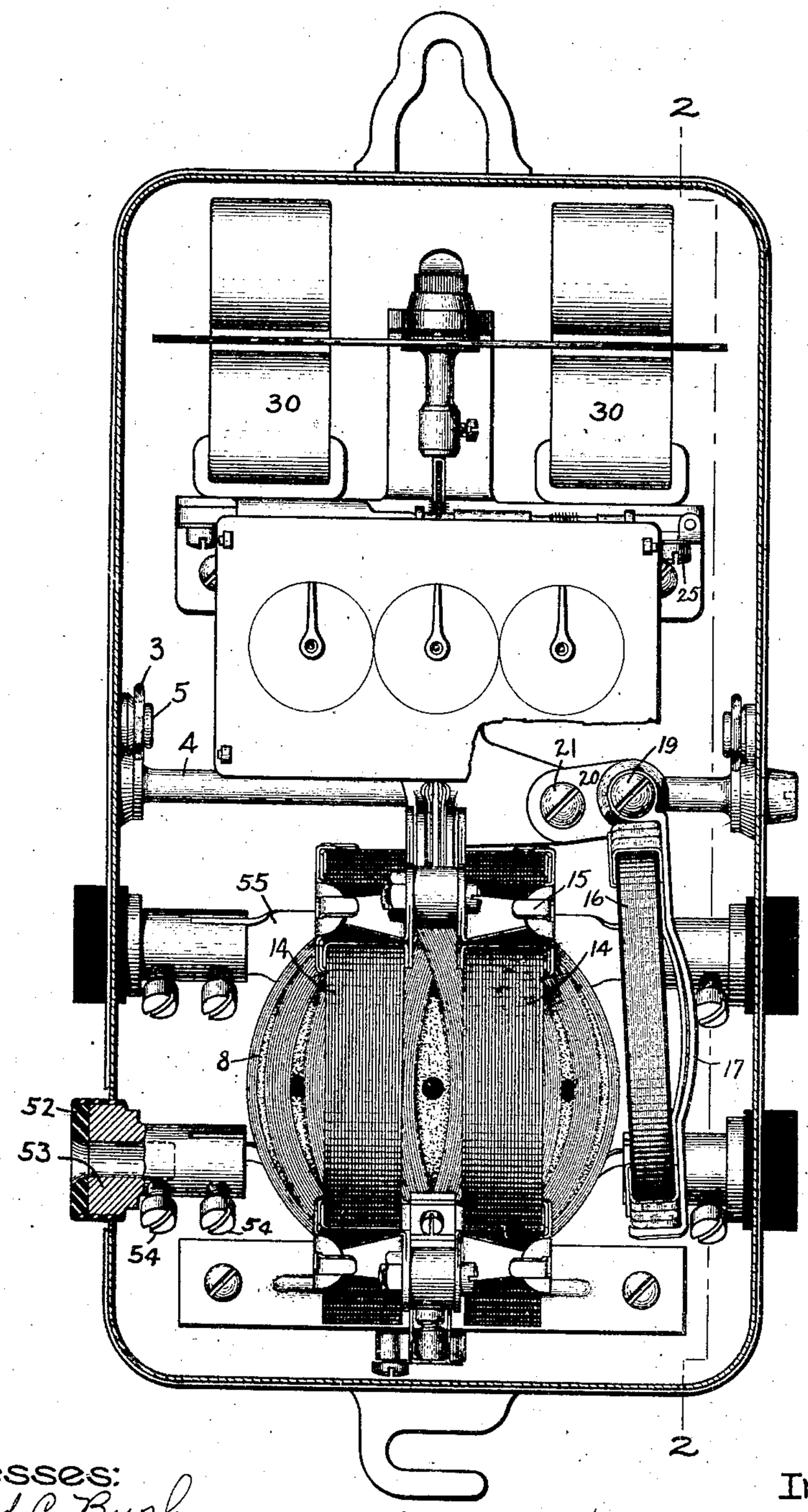
APPLICATION FILED JUNE 8, 1905.

908,427.

Patented Dec. 29, 1908.

3 SHEETS—SHEET 1.

Fig. 1.



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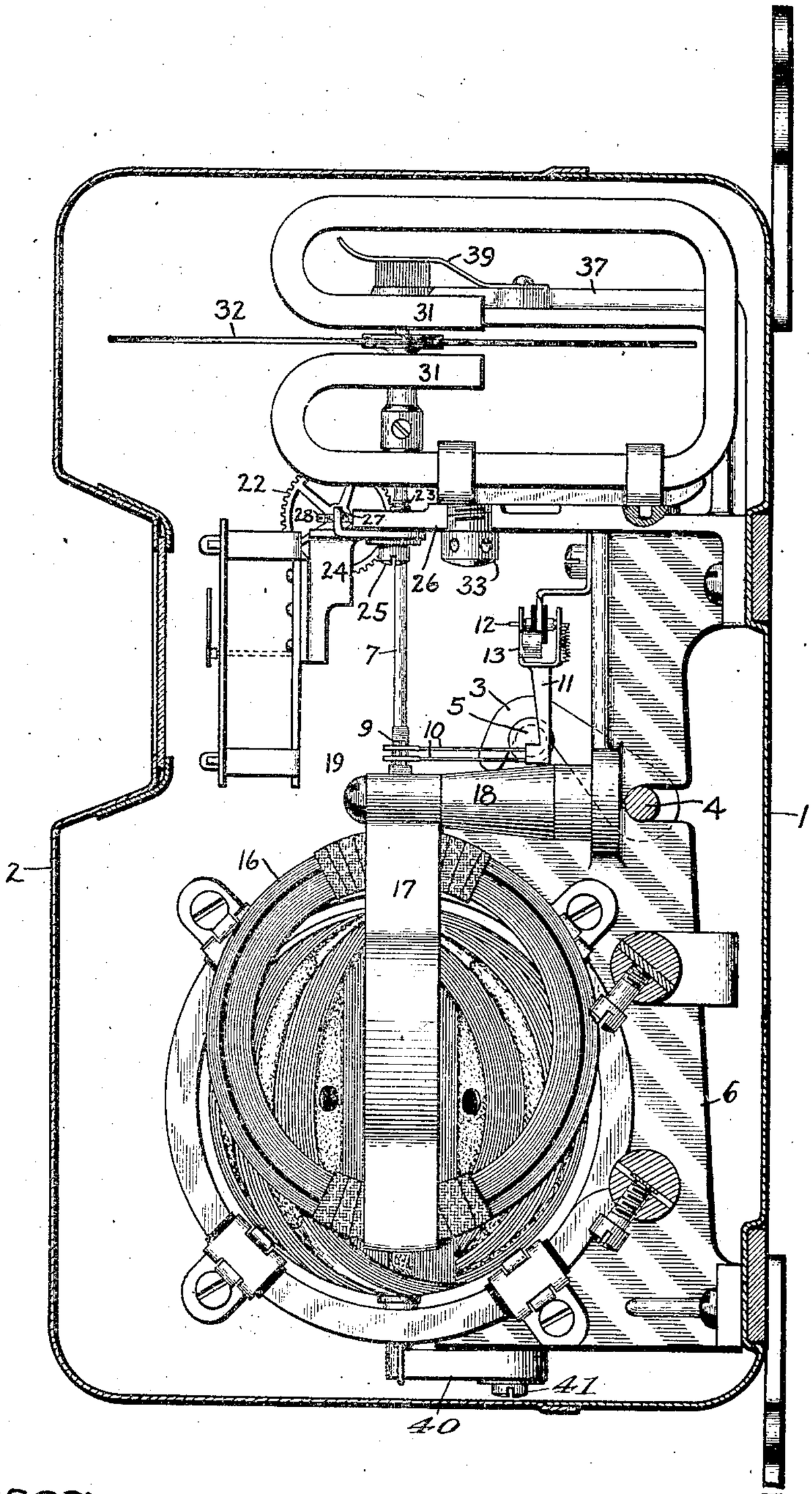
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

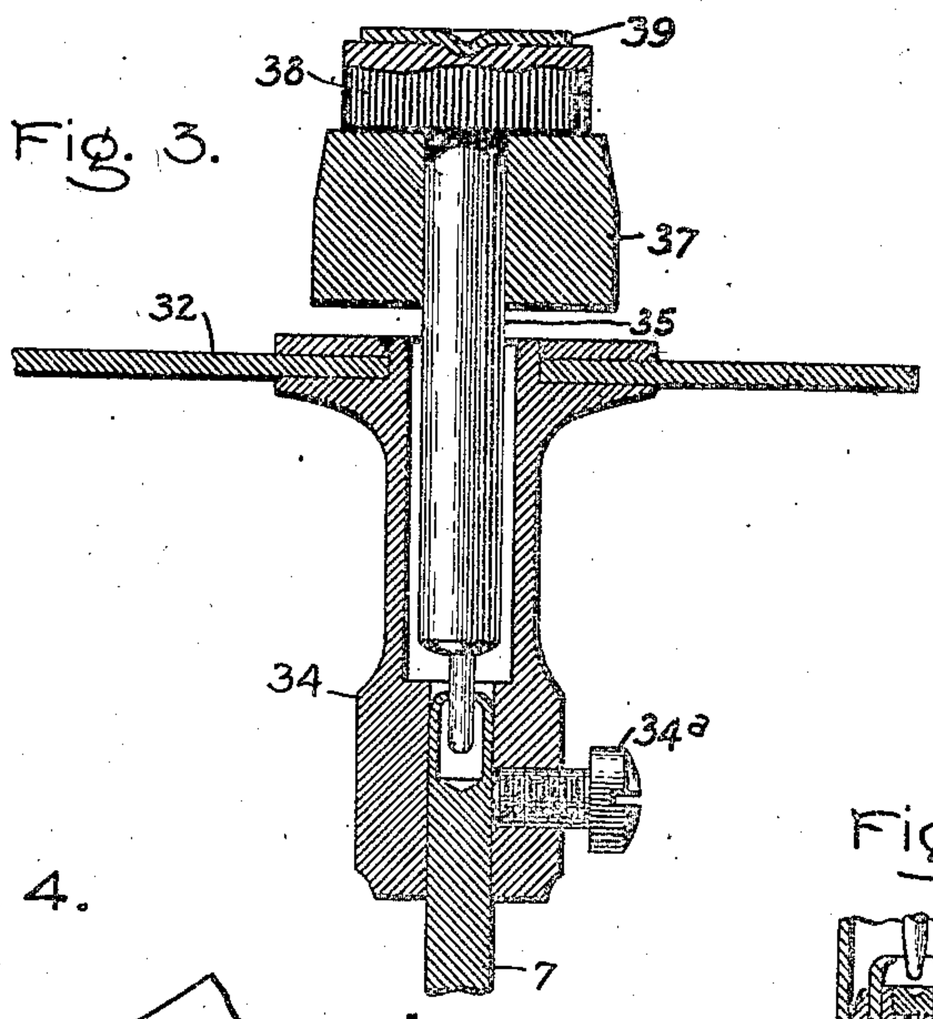


Fig. 4.

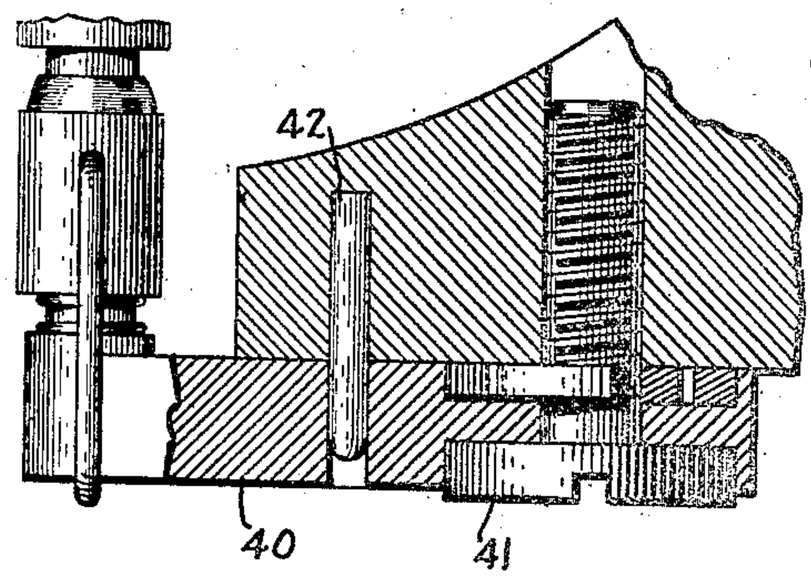


Fig. 6.

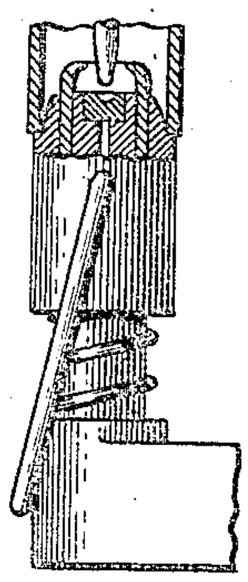


Fig. 5.

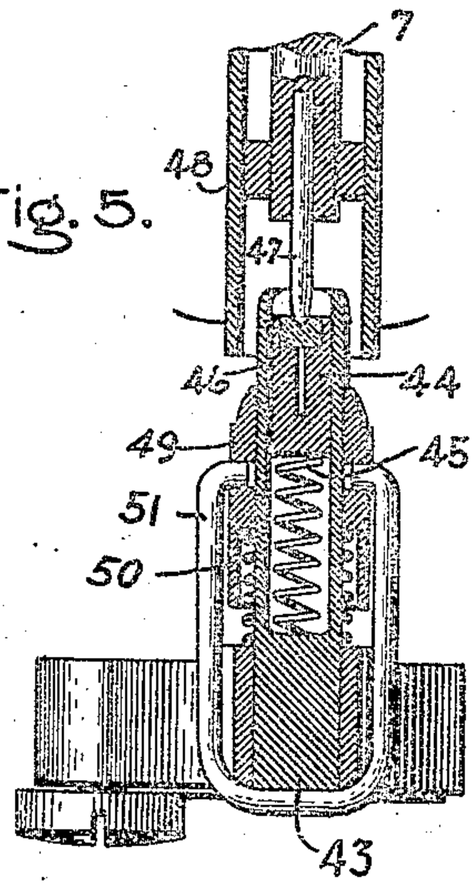
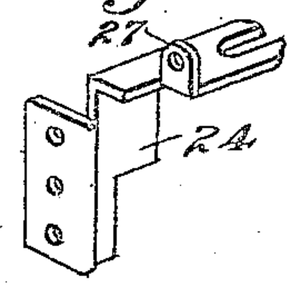


Fig. 7.



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UNITED STATES PATENT OFFICE.

GEORGE E. STEVENS, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC METER.

No. 908,427. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed June 8, 1905. Serial No. 264,254.

To all whom it may concern:

Be it known that I, GEORGE E. STEVENS, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Electric Meters, of which the following is a specification.

This invention relates to electric measuring instruments and more particularly to integrating electric wattmeters.

The object of my invention is to effect certain improvements in the design of instruments of this type whereby the construction is simplified and the cost of production reduced.

The features of my invention are particularly applicable to integrating electric meters of the commutating motor type but they are not limited in their application in this respect.

The details of the construction and the method of operation of my improved meter will be better understood by reference to the following description taken in connection with the accompanying drawings which show the preferred embodiment of my invention. I will definitely indicate in the claims appended hereto the novel features of my invention.

In the drawings, Figure 1 is a front view of the meter with some of the parts in section; Fig. 2 is a section on line 2—2 of Fig. 1; Fig. 3 is a section of the upper bearing; Fig. 4 is a sectional elevation of the lower bearing; Figs. 5 and 6 are detail views of the lower bearing; and Fig. 7 shows a detail of the support for the wheel-train.

My improved meter consists of a commutating electric motor having its moving element geared to a dial register and a damping device for retarding the rotations of the moving element.

Referring to the drawings, the operating parts of the meter are inclosed within a casing consisting of a back 1 and a cover 2 which is held to the back by hooks 3 carried by a rod 4 and arranged to engage lugs 5 on the cover. The rod 4 can be turned from outside the casing and suitable openings are provided to receive a sealing wire to prevent the rod from being turned so that the hooks 3 release the projections 5 and thus permit the removal of the cover. Secured to the back 1 is a frame 6 carrying bearings for a shaft 7 on which is mounted the armature 8 of the motor. The armature 8 consists of a plurality of coils preferably wound so as to form a sphere having an air core. The coils of the armature are connected to the segments of a small commutator 9 carried by shaft 7 and brushes 10 bear on the commutator to carry the current to and from the coils of the armature. The brushes 10 are carried by holders 11 which are pivotally suspended from insulated rods 12. Each of the holders 11 is provided with a laterally-extending arm carrying a weight 13 which holds the brushes 10 against the commutator 9 with a constant pressure.

Mounted in inductive relation to the armature 8 are two field coils 14. These coils are preferably circular and mounted on opposite sides of shaft 9 closely encircling the portions of the armature inclosed thereby so that the number of stray lines of force is reduced as much as possible; they are formed from ribbon conductor wound on edge with the several turns insulated one from another and are held by clamps 15 as shown in Figs. 1 and 2. In order to compensate for friction in the bearings and the dial train and between the brushes 10 and commutator 9, I provide an auxiliary field coil 16 also mounted in inductive relation to armature 8. This coil is held between clamps 17 pivotally mounted upon a support 18 and arranged to be locked upon the support in any desired position by a screw 19. The support 18 is provided with an offset 20 at its base and a screw 21 extends through this offset and into the frame 6. The friction compensating coil 16 can therefore be turned on the support 18 to adjust its position relatively to the armature 8 in a plane substantially transverse to the shaft 7 and the support 18 and the coil carried thereby can be turned about the screw 21 as a center so as to adjust the position of the coil 16 relative to the armature 8 in a plane substantially parallel to the shaft 7 and can be locked in the desired position by the screws 19 and 21. This double adjustment of the coil 16 thus gives a wide range of friction compensation within a very small space.

The rotation of the moving element of the meter is retarded by permanent magnets mounted in coöperative relation to a metal disk or similar closed conductor carried by the shaft of the moving element. In order that the magnetism of these permanent magnets may be affected as little as possible

by the field set up by the coils 14 I separate these parts by mounting the magnets at the top of the meter and the motor at the bottom and I place most of the other parts, namely, the dial train, the commutator and the brushes, in the space between them. The register consists of a train of gears driven by a worm wheel 22 which meshes with a worm 23 on the shaft 7. A plate 24 is secured to the back of the register and screws 25 extend through ears on this plate and into an arm 26 on the frame 6 to support the dial in position. The opening in the ear of plate 24 for the right-hand screw 25 is a slot open at the end as shown in Fig. 7, and a projection 27 is turned up on the plate and provided with a threaded opening to receive a screw 28 the end of which engages the end of arm 26 of the frame. Thus, by loosening the screws 25 the position of the dial can be delicately adjusted by turning screw 28 in order to bring the worm wheel 22 in proper relation to the worm 23. Also the slot for the right-hand screw 25 being open at the end, the entire dial may be swung around on the left-hand screw as a pivot to give better access to the brushes and other parts and in restoring it to its original position, the adjustable stop 28 limits the movement of the dial toward the shaft and insures the return of the dial to its proper position.

Mounted on top of the arm 26 are two permanent magnets 30. These permanent magnets have their integral poles 31 bent around so that they extend toward the yoke of the magnet, as shown in Fig. 2. By bending the poles in this manner a greater length of magnet is obtained relatively to the space occupied, and on account of this greater length the magnetism is more nearly permanent. A closed conductor 32 consisting of a disk of conducting material is carried by shaft 7 and rotates between the parallel pole faces of the magnets 30 so as to retard the rotations of the moving element of the meter. The magnets 30 are mounted so as to permit moving the poles 31 toward or away from shaft 7 to adjust the retarding effect and may be locked in any adjusted position by a screw 33. In order that the proper relation between the worm 23 and worm-wheel 22 shall be maintained at all times, the upper bearing for shaft 7 should be very close to the worm 23. I therefore provide a sleeve 34, as shown in Fig. 3, secured to the upper end of shaft 7 by a set-screw 34^a and arranged to carry the disk 32 at its upper end and an upper bearing plug 35 which extends down into the opening in the sleeve 34 and has its lower end reduced so as to form a pivot pin for shaft 7. The bearing plug 35 is mounted in an opening in an arm 37 of the frame 6 and is provided with a knurled head 38. A flat spring 39 is secured to the arm 37 and holds the head 38 down upon the arm 37 so as to maintain the bearing plug 35 in position. By this construction the bearing point is close to the worm but the permanent magnets and the disk coöperating therewith which is carried by the shaft are separated from the meter-motor by considerable space and this space is occupied by the dial and other parts.

The lower bearing for shaft 7 consists of a supporting arm 40 secured to the bottom of frame 6 by a screw 41. A dowel 42 on the frame extends into an opening in the support 40 to hold it in proper position. In an opening in the outer end of the support 40 is a hollow bearing post 43 carrying a bearing plug 44 supported upon a spiral spring 45. Plug 44 carries a suitable jewel 46 which is cupped to receive the end of a pivot pin 47 in the end of the shaft 7. A sleeve 48 is secured upon the lower end of shaft 7. Mounted to slide freely upon the bearing post 43 is a sleeve 49 and a spiral spring 50 is coiled about post 43 between the bottom of sleeve 49 and the upper side of arm 40. A bail 51 is pivoted in openings in the sleeve 49. When the meter is in use the sleeve 49 is held in a retracted position against the tension of spring 50 by the bail 51 the bight of which passes over the end of arm 40, as shown in Figs. 4 and 5; but when the meter is to be shipped from one place to another the sleeve 49 is released by turning the bail 51 on its pivots until it is free from arm 40 and the spring 50 raises the sleeve until a shoulder thereon engages the sleeve 48 on shaft 7 and raises the shaft and all the parts carried thereby so that the pivot pin 47 is out of engagement with the jewel 46, as shown in Fig. 6.

In each side of the back 1 of the meter casing are two openings in each of which a cup-shaped insulating bushing 52 having an opening therethrough is secured and a binding post 53 fits tightly in each of these bushings. Each binding post consists of a metallic block having a slot cut in one end and an opening in the other end in alinement with the opening in the bushing 52 to receive a line wire. Screws 54 enter threaded openings in the post, one leading to the slot and the other to the opening for the line wire. A metallic ribbon 55 connects the two upper binding-posts 53, its ends fitting in the slots in the adjacent ends thereof where they are held by the screws 54. One end of each of the series coils 14 is brought down and inserted in the slot in the end of one of the lower binding-posts 53 where it is held by a screw 54 to connect the coils 14 in series in one of the lines. The shunt circuit of the meter is connected between one of the upper pairs and one of the lower pairs of binding-posts and includes the coils of the armature 8 and the friction compensating coil 16. In order that the current flowing in this circuit shall be very small it is the usual practice to insert a resistance of

large ohmic value in this circuit. I prefer to wind this resistance together with the friction compensating coil 16 so as to form a single coil. The resistance coil, however, must be wound non-inductively so that it will have no torque-producing effect upon the armature 8. I therefore wind a portion of the turns of coil 16 in one direction and the remaining portion in the opposite direction and make the numbers of turns in the two portions such that the difference between them is the number of turns required in the friction compensating coil.

I do not wish to be understood as limited to the exact construction which I have shown and described herein as many modifications can be made therein without departing from the spirit of my invention. All such modifications I aim to cover in the claims appended hereto.

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

1. In an electric meter, a friction compensating coil, a support on which the coil is pivotally mounted, a frame, and a pivotal connection between said support and frame whereby the coil is adjustable in two different planes.

2. In an electric meter, a shaft, an armature carried thereby, a sleeve secured to the end of the shaft, a gear carried on the shaft between the armature and the sleeve, a registering train driven by said gear, a plate of conducting material carried by the sleeve, a magnet coöperating therewith to retard the rotation of the shaft, a frame, and a bearing mounted on the frame and extending through the sleeve close to said gear to support said end of the shaft.

3. In an electric meter, a vertical shaft, a lower bearing therefor, a post carrying the bearing, a sleeve mounted to slide freely upon the post, a spring pressing the sleeve upward, means attached to the sleeve for locking it in a retracted position, and a portion on the shaft engaged by the sleeve when released to raise the shaft out of engagement with the bearing.

4. In an electric meter, a vertical shaft, a lower bearing therefor, a post carrying the bearing, a sleeve mounted to slide freely upon the post, a spring coiled about the post pressing the sleeve upward, a bail connected to the sleeve and arranged to lock it in a retracted position, and a portion on the shaft engaged by the sleeve when released to raise the shaft out of engagement with the bearing.

5. In an electric meter of the commutator type, a vertically-arranged armature-shaft, a frame provided with bearings for said shaft, a vertically-adjustable post mounted on said frame and extending into proximity with the meter armature, and an auxiliary field coil in inductive relation to said armature pivotally mounted on the end of said post.

6. In an electric meter of the commutator type, a vertically-arranged armature-shaft, a frame provided with bearings for said shaft, an arm adjustably pivoted at one end on said frame in a plane parallel to the armature-shaft, a post carried by the other end of said arm and extending into proximity with the armature, and an auxillary field coil in inductive relation to the armature hinged to the end of said post.

In witness whereof, I have hereunto set my hand this sixth day of June, 1905.

GEORGE E. STEVENS.

Witnesses:
JOHN A. McMANUS, Jr.,
HENRY O. WESTENDARP.