No. 835,321.

PATENTED NOV. 6, 1906.

W. H. PRATT.

ELECTRIC METER.

PPLICATION FILED APR. 20, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

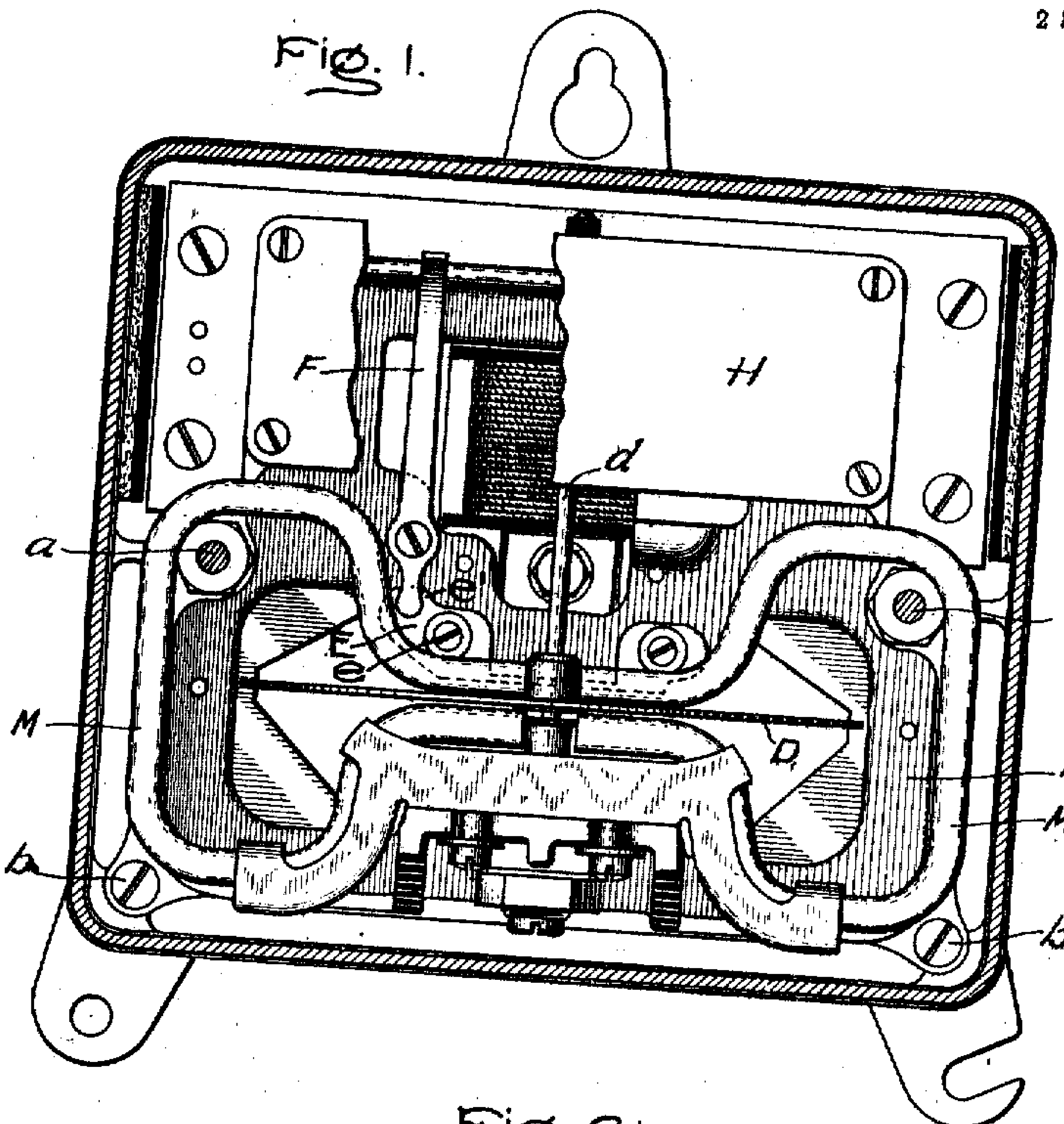
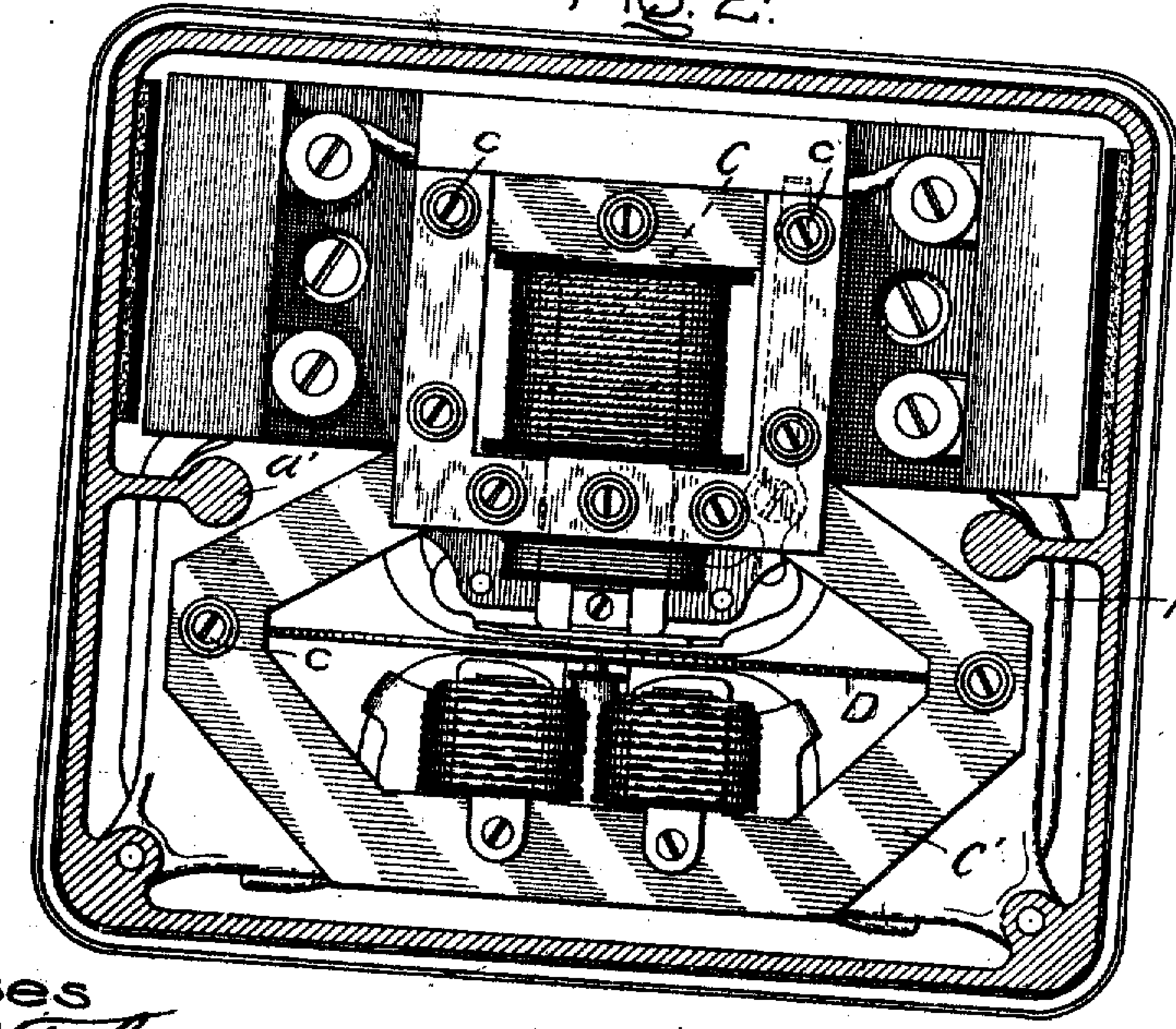


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

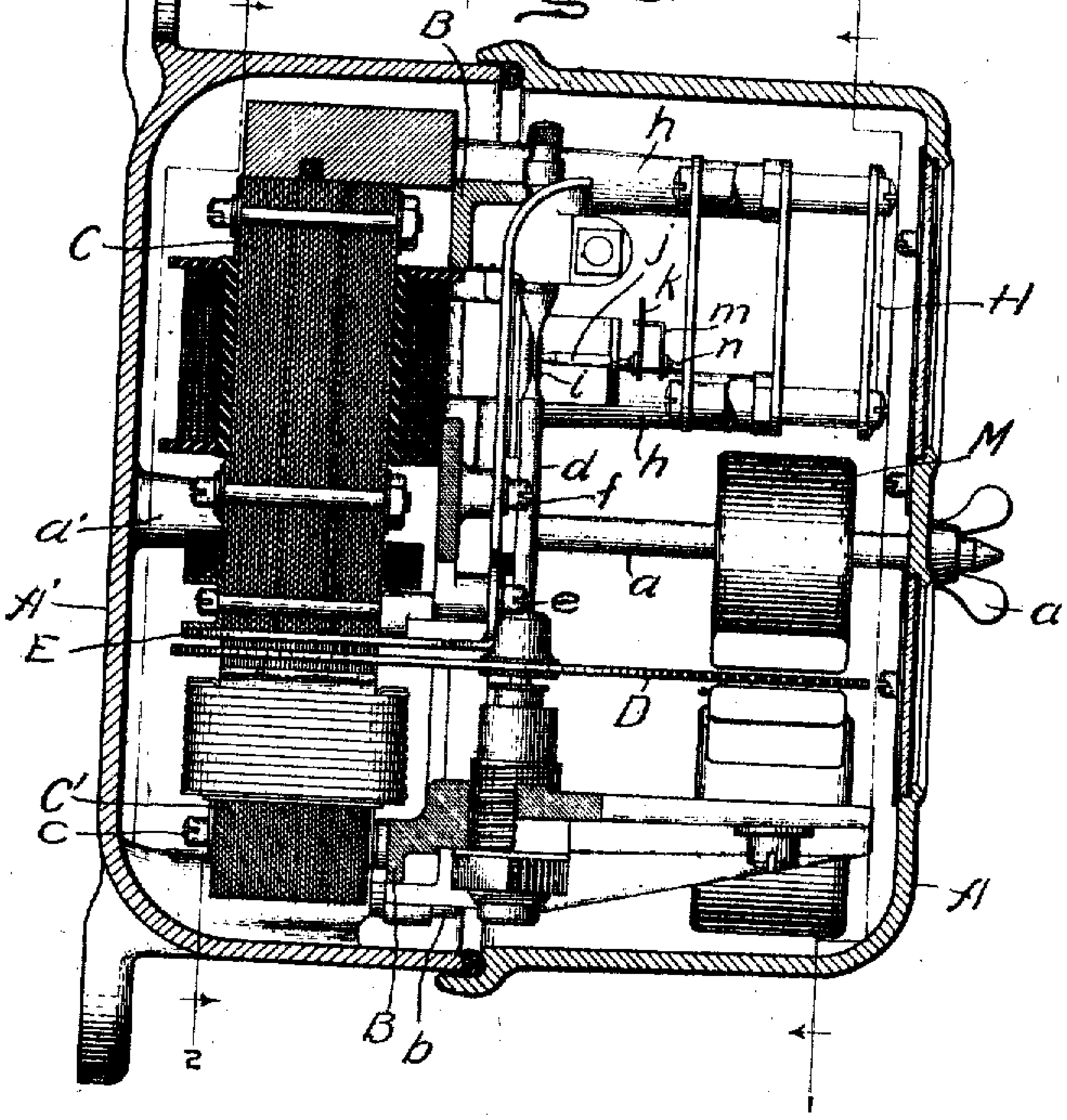


Fig. 5.

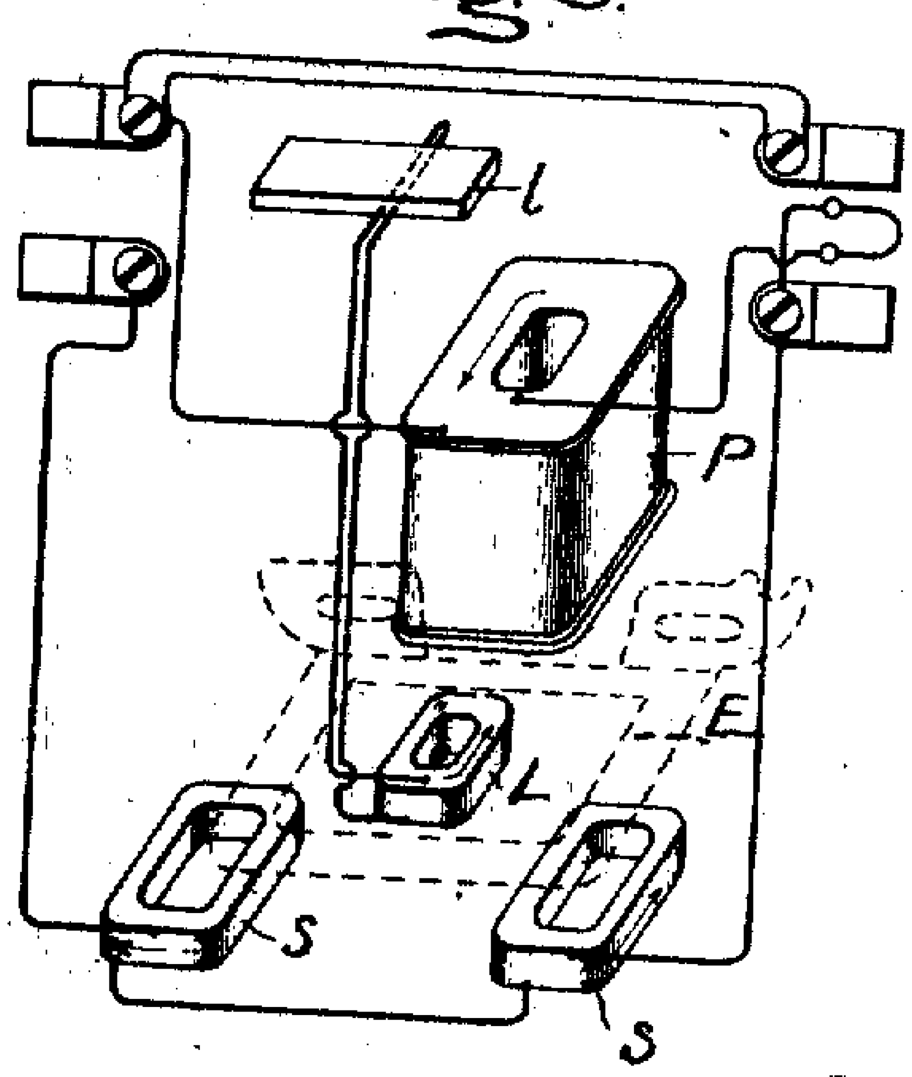


Fig. 6.

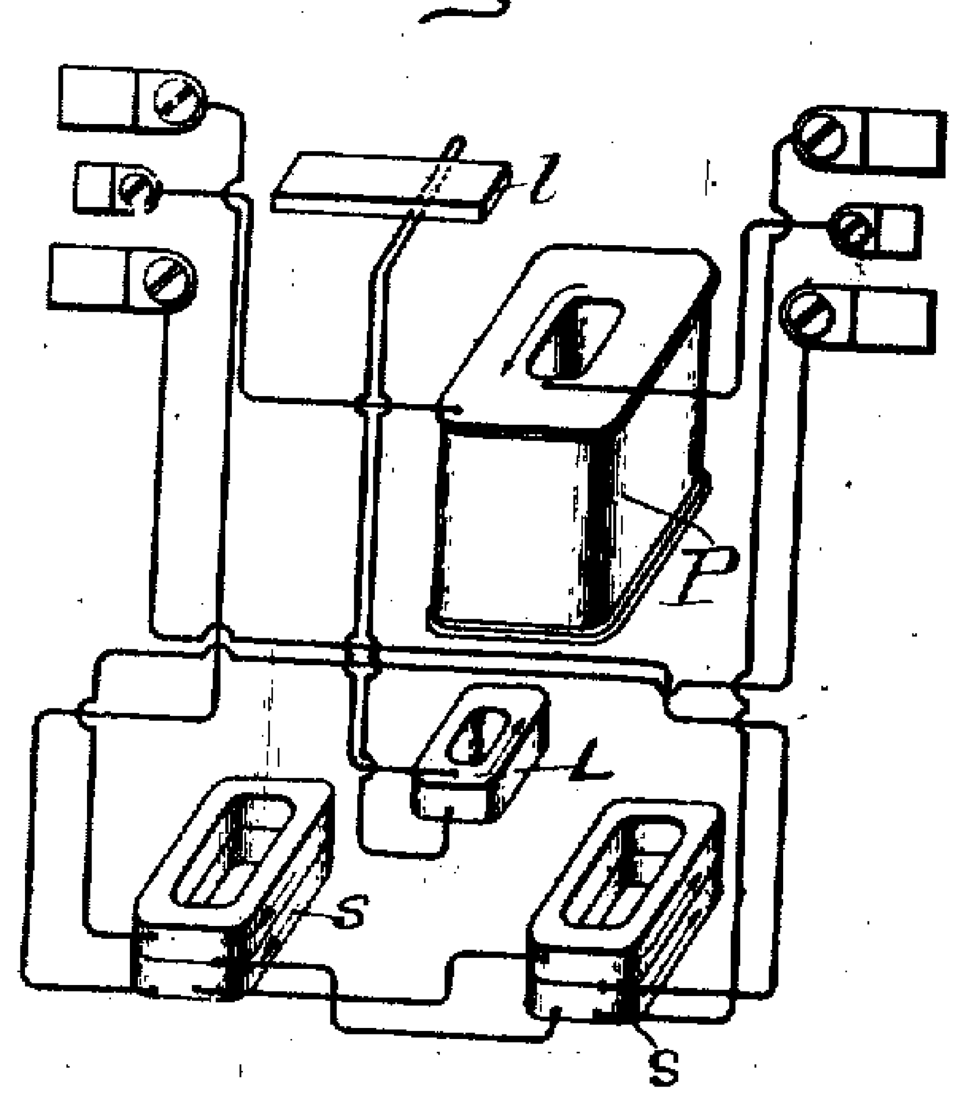
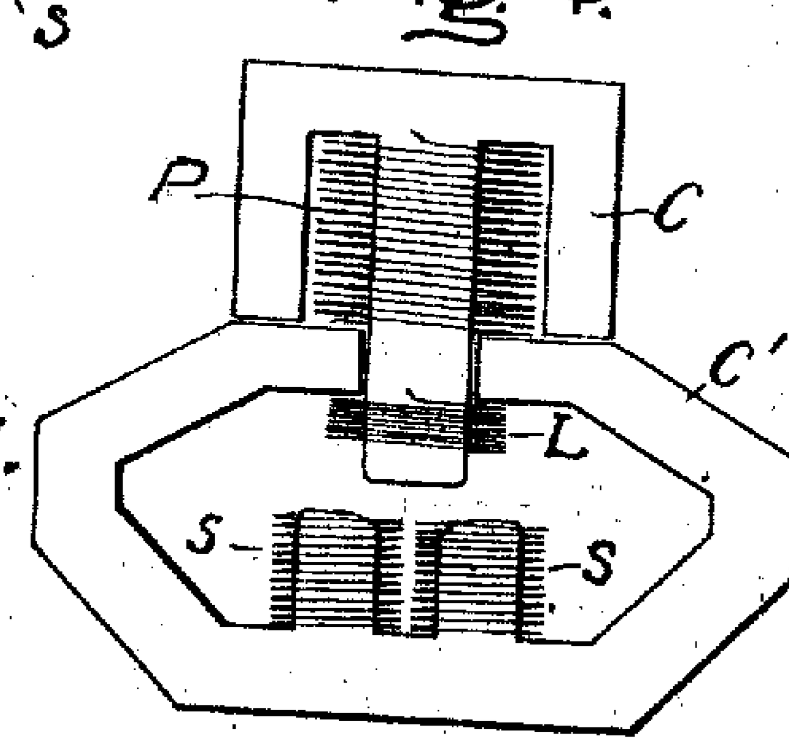


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

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ELECTRIC METER.

No. 835,321. **Specification of Letters Patent.** **Patented Nov. 6, 1906.**

Application filed April 20, 1904. Serial No. 204,061.

To all whom it may concern:

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

My invention relates to alternating-current induction-meters; and its object is to provide a wattmeter of simple and compact construction which shall operate efficiently and accurately on varying loads and power factors.

One feature of my invention consists in the novel arrangement of the magnetic circuit whereby a high torque and proper phase displacement are secured for all loads and power factors.

Another feature of my invention consists in providing means for counterbalancing the starting-friction, whereby the adjustment for compensating for friction does not alter the phase displacements of the magnetic circuit.

Another feature of my invention consists in a novel connection between the moving element of the meter and the recording mechanism, whereby a displacement of one relative to the other does not introduce errors in the record by changing the friction losses.

Other features of my invention will appear from the following specification and from the accompanying drawings, in which—

Figure 1 shows a front view in elevation of a meter constructed in accordance with my invention with the front cover cut away. Fig. 2 shows a rear view in elevation of the same with the back of the cover cut away. Fig. 3 shows a side elevation of the same in cross-section, the lines 1 1 and 2 2 in this figure indicating the planes in which the views of Figs. 1 and 2, respectively, are taken. Fig. 4 shows diagrammatically the magnetic circuit of the meter, and Figs. 5 and 6 show diagrammatically the relative positions and connections of the coils of the meter.

Referring first to Fig. 3, A represents the front cover of the meter, which is secured to the back cover A′ by the bolts *a*. The bolts *a* are threaded at both ends, one end screwing into the studs *a′* of the back cover A′ and the other end receiving the nut *a″*. B represents the frame, to which all working parts of the meter are attached. Frame B is bolted to the back cover A′ by the bolts *b* and is also held in place by the bolts *c*, that pass through frame B. With this construction it is evident that after the front cover is removed frame B, with all the working parts thereto attached, may be removed by loosening bolts *b* without detaching the back cover A′ from the support.

The motive part of the meter comprises the movable armature D, which consists of the usual conducting-disk and the stationary magnetic circuit, with its energizing-coils. Disk D is carried by shaft *d*, which is supported in the usual manner on jewel-bearings carried by the frame B. The stationary magnetic circuit consists of two laminated cores C and C′, secured to frame B by the bolts *c*. The arrangement of the magnetic circuit and its coils will best be understood by reference to Fig. 4. In this figure core C is shown with three parallel members connected at the top with the potential-coil P, mounted on the central member. Core C′ has its extremities extending into close proximity with the three members or poles of core C, thereby forming with core C a nearly-closed magnetic circuit for potential-coil P, whereby current in coil P is lagged in the manner well understood in the art. Core C′ is provided with two poles facing the central pole of core C. On these poles are placed the series or current coils S.

The disk, which is not shown in Fig. 4, is disposed between the poles on which coils S are placed and the central pole of core C. The leakage flux of coil P, which does not pass through the nearly-closed circuit offered by the extremities of core C′, passes from the central pole of core C through the disk to the poles on which are mounted the coils S S. The coils S S are oppositely wound and produce fluxes which with the flux from the central pole of core C produce a shifting resultant flux and consequent rotation of the disk, in a manner well understood in the art. The short-circuited coil L is mounted on the middle pole of core C and is traversed by the flux that passes through the disk to the poles of the series coils, and thereby produces the ninety-degree displacement of the potential flux from that of the series coils in the manner understood in the art.

It will be seen from the drawings and from the above description that the series coils have a nearly-closed magnetic circuit and accordingly exert a strong torque. The arrangement of the cores C and C′ is compact and well adapted for producing the proper phase displacement of the fluxes.

In order to compensate for the starting-friction, I provide the closed circuit E, which is suspended directly above the disk and which may be moved horizontally toward either series coil. When this closed circuit is in its central position, symmetrically disposed with reference to the magnetic circuit of the shunt-coil, it has no effect upon the starting torque of the meter. If it is moved in either direction from its central position so that it is assymmetrically disposed with reference to the said magnetic circuit, torque is produced thereby in one direction or the other, and the starting-friction is thereby compensated for. Moreover, since there are two series coils and since the closed circuit E by its movement includes more of the flux from one coil as it includes less from the other, the phase displacement of the fluxes is not altered by its adjustment. Consequently I have provided a simple means for compensating for starting-friction without varying the phase displacement, and thereby impairing the accuracy of the meter. The closed circuit E, which is formed as a simple rectangular loop, as shown in Fig. 5, is supported from frame B by the clamping-screws e, as shown in Figs. 1 and 3. The clamping-screws e pass through slots in lugs on the end of plate E, as shown in Figs. 1 and 3, and permit the member E to be moved horizontally by means of the lever F, which is pivoted at f and engages one of the upturned lugs of member e'.

The drag-magnets M are shown in Figs. 1 and 3 and are supported from frame B, as indicated in the drawings. The dial-plate H is supported on studs h, carried by frame B, as shown in Fig. 3. The connection between the disk D and the mechanism for the dial-plate is as follows: Shaft d carries a worm i, which engages a gear-wheel mounted on shaft j, which is supported from frame B in close proximity to the upper support of shaft d. The maintenance of perfect alinement between worm i and shaft j is thereby assured. Shaft j carries an arm k, which as it revolves engages a pin m, carried by shaft n, which is connected to the gear-train. (Not shown.) Arm k drives pin m by simply pressing against it, thereby forming a loose yet positive connection between shaft j and shaft n. Any displacement of the dial H with its gear-train relative to disk-shaft d can produce no binding in any part of the transmitting mechanism, and consequently can introduce no frictional error.

Fig. 5 shows diagrammatically the arrangement of the coils and their connections. The lagging coil L has its terminals brought up to the terminal plate l in order that its effect may be varied by the insertion of resistance in its circuit, if required. Fig. 6 shows a modified arrangement in which two sets of series coils are used. Such an arrangement is suited for measurement of energy on a three-wire system. No further explanation is believed necessary.

While I have shown a complete embodiment of my invention, it will be understood that the construction and arrangement of parts may be greatly changed without departing from the spirit of my invention. Furthermore, I have shown and described several novel features which I desire to claim whether used together or singly.

Accordingly I do not desire to limit myself to the particular construction and arrangement of parts here shown, since changes which do not depart from the spirit of my invention and which are within the scope of the appended claims will be obvious to those skilled in the art.

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

1. In an electric meter, a magnetic core comprising three parallel members joined at one end, a potential-coil mounted on the central member thereof, a rotatable disk mounted opposite said central member, a second core extending into close proximity to said members and forming therewith a nearly-closed magnetic circuit for said potential-coil independent of said disk, and a series winding arranged opposite said central member on the other side of said disk.

2. In an electric meter, a magnetic core comprising three parallel members joined at one end, the central member extending beyond the other two, a potential-coil mounted on said central member, a second core extending into close proximity to said members and forming therewith a nearly-closed magnetic circuit for said potential-coil, a closed-circuited coil mounted on the extension of said central member, a series winding disposed opposite the end of said central member, and a rotatable disk mounted between said central member and said series winding.

3. In an electric meter, a magnetic core comprising three parallel members joined at one end, a potential-coil mounted on the central member thereof, a rotatable disk mounted opposite said central member, a second core extending into close proximity to said members and forming therewith a nearly-closed magnetic circuit for said potential-coil independent of said disk, and a series winding mounted on said second core opposite said central member.

4. In an electric meter, a magnetic core comprising three parallel members joined at one end, the central member extending beyond the other two, a potential-coil mounted on said central member, a second core ex-

tending into close proximity to said members and forming therewith a nearly-closed magnetic circuit for said potential-coil, a closed-circuited coil mounted on the extension of said central member, a series winding mounted on said second core opposite said central member, and a rotatable disk mounted between said central member and said series winding.

5. In an electric meter, a magnetic core comprising three parallel members joined at one end, a potential-coil mounted on the central member thereof, a rotatable disk mounted opposite said central member, a second core extending into close proximity to said members and forming therewith a nearly-closed magnetic circuit for said potential-coil independent of said disk and having two polar projections opposite to the central member of the first core, and series coils mounted on said polar projections.

6. In an electric meter, a magnetic core comprising three parallel members joined at one end, the central member being longer than the other two, a potential-coil mounted on said central member, a second core extending into close proximity to said members and forming therewith a nearly-closed magnetic circuit for said potential-coil and having two polar projections opposite to said central member, and series coils mounted on said polar extensions.

7. In an electric meter, a magnetic core comprising three parallel members joined at one end, the central member extending beyond the other two, a potential-coil mounted on said central member, a second core extending into close proximity to said members and forming therewith a nearly-closed magnetic circuit for said potential-coil and having two polar projections opposite to said central member, series coils mounted on said polar projections, and a closed-circuited coil mounted on the extension of said central member.

8. In an electric meter, a magnetic core having polar projections, a potential-coil mounted thereon, a rotatable disk opposite said polar projections, a second core extending into close proximity to the first core and forming therewith a nearly-closed magnetic circuit for said potential-coil independent of said disk and having polar projections opposite to a pole on the first core energized by said potential-coil, and series coils mounted on said last-mentioned polar projections.

9. In an electric meter, a magnetic core, a potential-coil mounted thereon, a second core extending into close proximity to the first core and forming therewith a nearly-closed magnetic circuit for said potential-coil and having two polar projections opposite to a pole of the first core energized by said potential-coil, series coils mounted on said projections, and a short-circuited coil mounted on said pole on the first core.

10. In an electric meter, a potential-coil, a pole energized thereby, two series coils, two poles energized thereby and facing the first-named pole, and a short-circuited member disposed between said two poles and the first-named pole and adjustable relatively thereto.

11. In an electric meter, a potential-coil, a pole energized thereby, two series coils, two poles energized thereby and facing the first-named pole, and a short-circuited conducting member disposed between said two poles and the first-named pole and adjustable in a plane perpendicular to the flux passing between said poles.

12. In an electric meter, a potential-coil, a pole energized thereby, two series coils, two poles energized thereby and facing the first-named pole, and a short-circuited conducting member embracing a portion of the flux from each series pole and adjustable to vary simultaneously and oppositely the portion of the flux from each series pole embraced thereby.

13. In an electric meter, a potential-coil, a pole energized thereby, two series coils, two poles energized thereby and facing the first-named pole, and a short-circuited conducting member embracing a portion of the flux from each series pole and adjustable toward either series pole in a plane perpendicular to the flux.

14. In an electric meter, a rotatable disk, magnetic poles on opposite sides of said disk, a short-circuited conducting member disposed between said poles and adjustable in a plane parallel to the plane of the disk, and a pivoted adjusting-lever engaging said member.

15. In an electric meter, a rotatable disk, magnetic poles on opposite sides of said disk, a short-circuited conducting member disposed between said poles and adjustable in a plane parallel to the plane of the disk, and a pivoted adjusting-lever engaging said member and movable in a plane perpendicular to the disk.

In witness whereof I have hereunto set my hand this 18th day of April, 1904.

WILLIAM H. PRATT.

Witnesses:
Dugald McK. McKillop,
Henry O. Westendarp.