W. H. PRATT.

ELECTRIC METER.

APPLICATION FILED APR. 20, 1904.

984,297

Patented Feb. 14, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

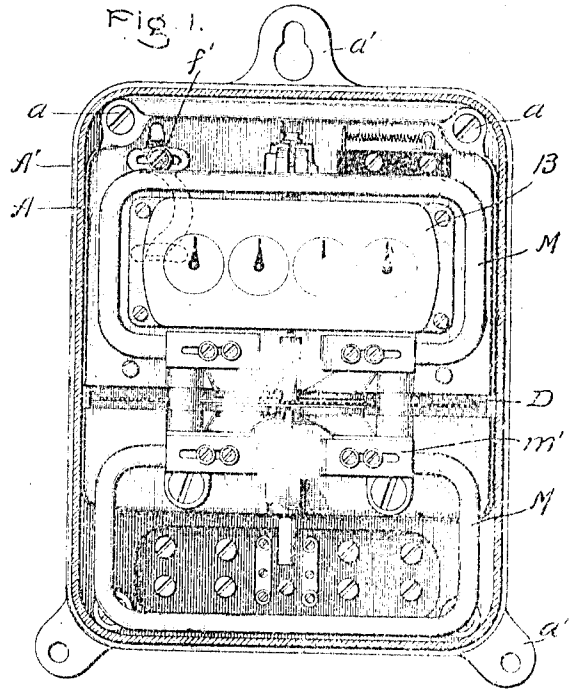
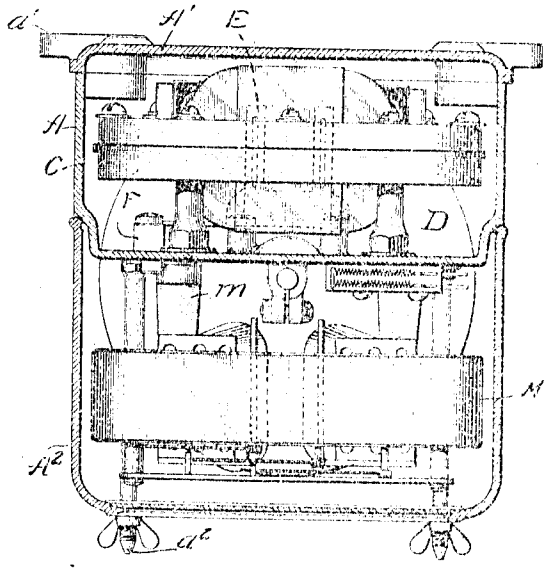


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

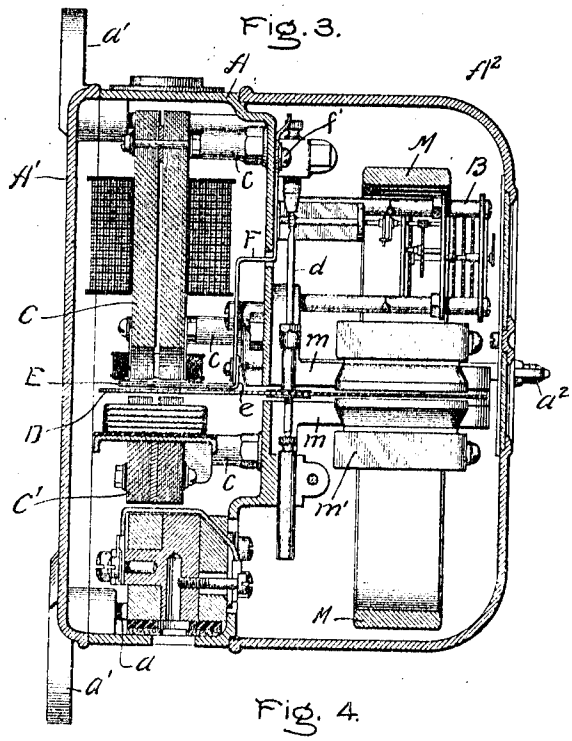
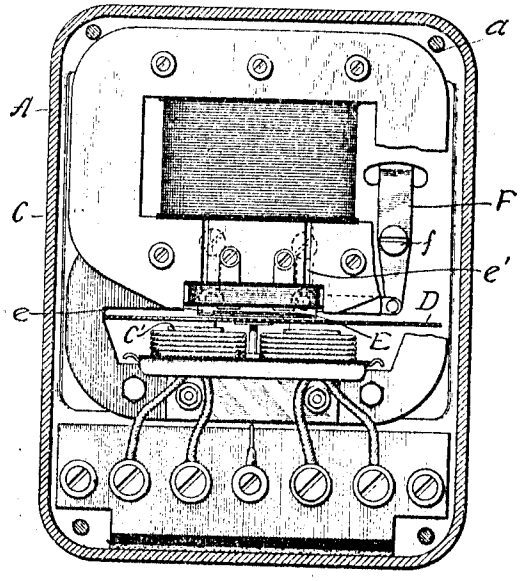


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

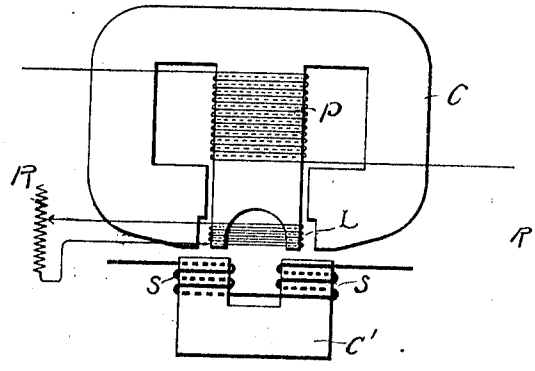


Fig. 6.

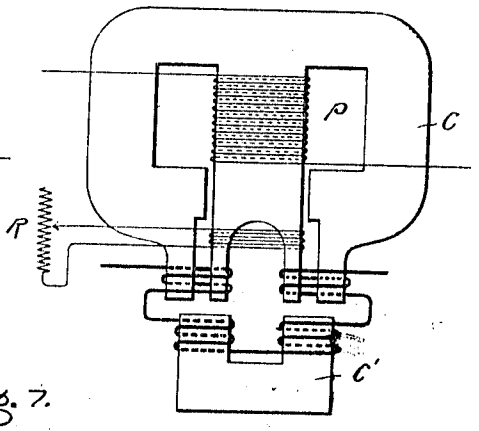
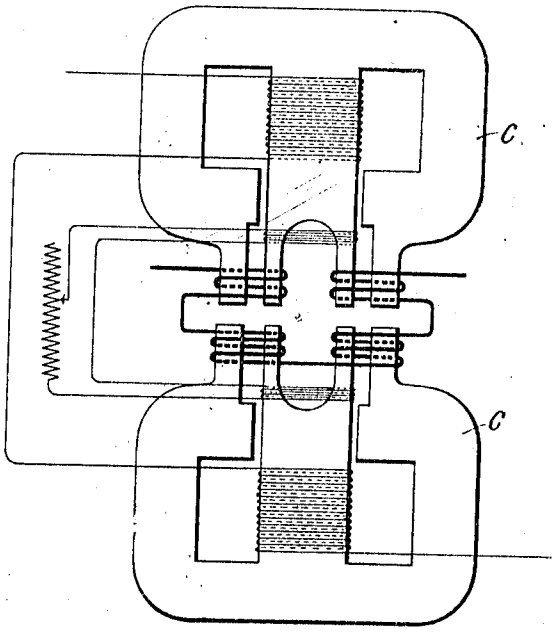


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM H. PRATT, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC METER.

984,297. Specification of Letters Patent. Patented Feb. 14, 1911.

Application filed April 20, 1904. Serial No. 204,060.

To all whom it may concern:

Be it known that I, WILLIAM H. PRATT, a citizen of the United States, residing at Lynn, 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 will operate efficiently and accurately on varying loads and power factors.

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

Another feature of my invention consists of a novel form of means for counterbalancing the starting friction.

Another feature of my invention consists in a novel arrangement of the magnetic shield between the motive parts of the meter and the drag mechanism and of the other parts of the meter, whereby a compact structure is secured.

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

Figure 1 shows a front elevation of a meter arranged in accordance with my invention, the front cover being removed; Fig. 2 shows a plan view of the same, the top casing being removed; Fig. 3 shows a side elevation in cross-section; Fig. 4 shows a back view, the back cover being removed; Fig. 5 is a diagrammatic representation of the magnetic circuits; Fig. 6 shows a modification of the same; and Fig. 7 shows a further modification.

In the drawings, A′ represents the back portion of the casing provided with lugs a' for attaching the meter to its support.

A represents a second portion of the casing which is secured to the back cover A′ by means of the screws a.

A^2 represents the front cover of the meter which is secured to the member A by the bolts a^2.

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 member A. The stationary magnetic circuit consists of two laminated cores C and C′ secured to member A by the bolts e. The arrangement of the magnetic circuit and its coils will best be understood by reference to Fig. 5. In this figure, core C is shown as comprising a central member on which is wound the potential coil P and two parallel portions, each of which nearly completes the magnetic circuit of the central member, thereby lagging the current in coil P in the manner well understood in the art. In other words, the core C is of a rectangular shape having a central member on which is wound a potential coil, the rectangle being interrupted by a small air-gap at each side of one end of the central core. The core C′ is of a U-shape, each of its poles facing one of the air-gaps in core C, and each carrying thereon a series coil S. The disk, which is not shown in this figure, is disposed between the two cores C and C′. The leakage flux of coil P, which does not pass across the air-gaps and through the nearly closed magnetic circuit of core C, passes through the disk to the poles of core C′. The coils S S are oppositely wound and produce fluxes which, with the leakage flux of coil P, produce a shifting resultant flux and consequent rotation of the disk in a manner well understood in the art. The coil L, short-circuited through the resistance R, is mounted on the end of the central member of core C, and is traversed by the potential leakage flux, which passes from the central member through the disk, and thereby produces the 90 degree displacement of the potential flux through the disk in the manner well understood in the art. By varying the resistance R, the effect of coil L may be adjusted. It will be seen from the drawings that the series coils have a nearly closed magnetic circuit, and accordingly exert a strong torque.

In the arrangement of Fig. 6 the poles on core C on each side of each of the air-gaps are extended, and a portion of the series winding is placed on these extended poles. In the arrangement of Fig. 7, the core C of Fig. 6 is duplicated, the second core C taking the place of the core C′.

In order to compensate for the starting friction, I provide the movable member E, which is suspended directly above the disk

and below core C. This member E has two up-turned ears *e*, as shown in Figs. 3 and 4, which are engaged by the two pivoted levers *e'* shown in dotted lines in Fig. 4. Member E is also engaged by the adjusting lever F, which is pivoted at *f*, and which projects through a slot in member A, as shown in Figs. 1 and 3. *f'* is a screw, by means of which adjusting lever F may be clamped in position. When adjusting lever F is moved on its pivot *f*, member E is swung on its suspending levers *e'* in a direction approximately parallel to the plane of the disk. The member E consists of two conducting portions, as shown in dotted lines in Fig. 2, each portion extending across the face of one of the poles of core C adjacent to the air-gaps, and each member being slotted as shown in Fig. 2, so as to produce an independent and effective short circuit under each of the poles of the potential coil. When member E is in its central position, symmetrically disposed with relation to the poles of core C, it has no effect upon the torque, but by shifting it in one direction or the other, by means of the adjusting lever F, a torque will be produced in one direction or the other, and the starting friction thereby compensated for.

M M represent the drag magnets, which are supported on the non-magnetic brackets *m* attached to the front side of member A. The two magnets are placed on opposite sides of disk D, with their unlike poles facing each other, so that the two magnets are placed in series, thereby forming a single magnetic circuit which cuts the disk in two places. By means of the adjustable pieces *m'* the reluctance of the leakage path may be varied, and the strength of the drag magnets thereby adjusted. It will be seen from the drawings that the poles of the drag magnets M are enlarged or flaring, so as to increase the cross-section of these magnets at the pole faces. By this means the reluctance of the air-gap at the disk is greatly reduced, and the effective strength of the magnets correspondingly increased.

B represents a dial equipped with the usual train of gears and driven by the disk D. The dial B is surrounded by one of the drag magnets M, thereby producing a very compact structure.

Member A is formed of magnetic material, and, as will be seen from the drawings, forms a practically complete magnetic screen between the motive parts of the meter and the drag magnets. This magnetic screen is continuous, except where it is slotted to afford passage for the disk, and consequently effectively prevents any undue influence of the drag magnets upon the motive parts. Furthermore it will be noticed that all the motive parts are secured to the rear of the magnetic screen formed by member A, while the dial and drag magnets and disk are supported from the front side of the member A. With this arrangement a very compact structure is secured, maintaining perfect alinement of the working parts and enabling them to be removed bodily from the back of the casing and its support.

While I have shown a complete embodiment of my invention, it will be understood that the construction and arrangement of parts may be varied without departing from the spirit thereof. 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 alternating-current meter, a magnetic core forming a nearly closed magnetic circuit having a central member and two members each joined at one end to the central member and at the other end separated therefrom by a small air-gap, a potential coil on the central member, a second magnetic core having poles disposed opposite to said air-gaps, and series coils on said poles.

2. In an alternating-current meter, a magnetic core forming a nearly closed magnetic circuit of approximately rectangular form having a central member, said rectangle being interrupted by a small air-gap at each side of one end of said member, a potential coil on said central member, a second magnetic core having poles disposed opposite to said air-gaps, and series coils on said poles.

3. In an alternating-current meter, a magnetic core forming a nearly closed magnetic circuit having two small air-gaps and poles on each side of each air-gap, a potential coil adapted to magnetize said core, a second magnetic core having poles disposed opposite to said air-gaps, and series coils on said last-named poles.

4. In an alternating-current meter, a rotatable disk, two poles or sets of poles on each side of said disk, and a conducting member forming two independent short-circuits between the opposing poles or sets of poles and adjustable in a direction approximately parallel to the plane of the disk.

5. In an alternating-current meter, a magnetic core having two air-gaps and poles on each side of each air-gap, a second core having poles disposed opposite to said air-gaps, a rotatable disk disposed between said cores, and a conducting member forming two independent short-circuits adjacent to said air-

gaps and adjustable in a direction approximately parallel to the plane of the disk.

6. In an alternating-current meter, a magnetic shield, a rotatable disk supported thereby, motive elements adapted to drive said disk supported from one side of said shield, and drag magnets supported from the other side of said shield.

7. In an alternating-current meter, a magnetic shield forming part of the meter casing, a rotatable disk supported thereby, motive elements adapted to drive said disk supported from one side of said shield, and drag magnets supported from the other side of said shield.

8. In a meter, a base portion, a member removably secured thereto and forming a partition of magnetic material through the meter, a rotatable conducting disk extending through said partition, motive elements for driving said disk on one side of said partition, and drag-magnets on the other side, said disk, motive elements, and drag-magnets being supported by said partition and removable therewith from the base portion.

9. In a meter, a base portion, a member removably secured thereto and forming a partition of magnetic material through the meter, a rotatable conducting disk extending through said partition, motive elements for driving said disk between said partition and the base portion, and drag-magnets and recording means in front of said partition, said disk, motive elements, drag-magnets and recording means being supported by said partition and removable therewith.

10. In a meter, a three-part casing comprising a base portion, a second portion adapted to be secured thereto and forming a partition through the meter, and a third portion adapted to be secured to the second portion, and meter elements operatively associated, some inclosed between the first and second portions and others between the second and third portions of the casing.

11. In a meter, a three-part casing comprising a base portion, a second portion adapted to be secured thereto and forming a partition through the meter, and a third portion adapted to be secured to the second portion, and meter elements operatively associated, all supported by said second portion, some between the first and second portions and others between the second and third portions of the casing.

12. In a meter, a three-part casing comprising a base portion, a second portion adapted to be secured thereto and forming a partition of magnetic material extending through the meter, and a third portion adapted to be secured to the second portion, a conducting rotatable disk supported by the second portion and extending through the partition formed thereby, means for driving the disk, and means for retarding the disk, said driving and retarding means being supported by said second portion on opposite sides of the partition.

13. An electric meter for use on alternating-circuits comprising in combination, a series electromagnet; a multipolar shunt-magnet; a coil connected as a shunt across the supply-mains and wound on a part only of said shunt-magnet whereby considerable magnetic leakage is produced from the remaining parts, together with a rotatable element mounted between said series and said shunt magnets, substantially as described.

14. An electric meter for use on alternating-circuits comprising in combination, a multipolar series electromagnet; a multipolar shunt-magnet; a coil connected as a shunt across the supply-mains and wound on a part only of said shunt-magnet whereby considerable magnetic leakage is produced from the remaining parts, together with a rotatable element mounted between said series and said shunt magnets, substantially as described.

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

WILLIAM H. PRATT.

Witnesses:
DUGALD McK. McKILLOP,
HENRY O. WESTENDARP.