No. 624,141. Patented May 2, 1899.

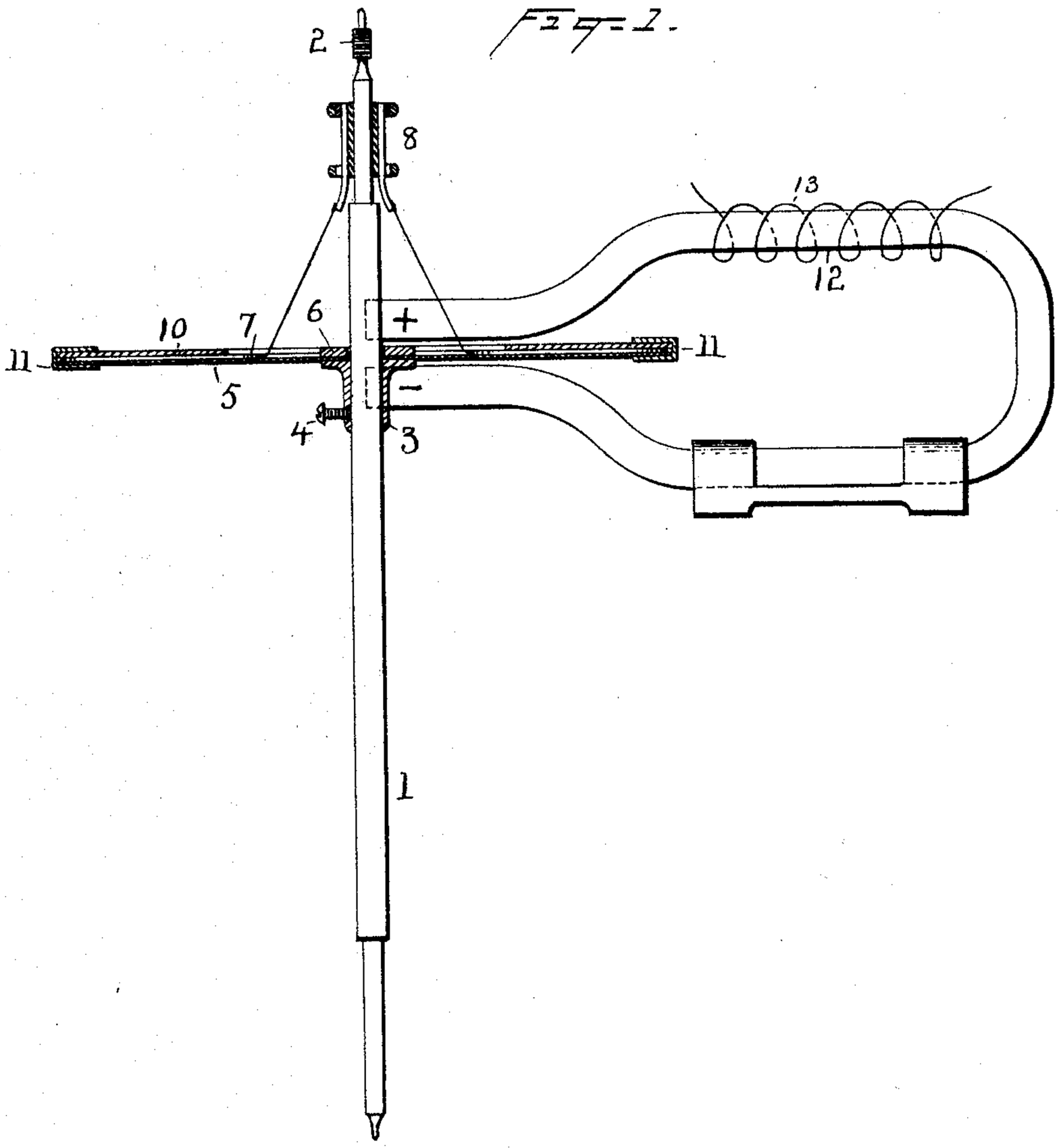
R. S. WHITE.

ELECTRIC METER.

(Application filed Sept. 2, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



WITNESSES

Norris A. Clark.

Jno. R. Taylor

INVENTOR

Roger S. White

by Rich'd N. Dyer

ATT'Y

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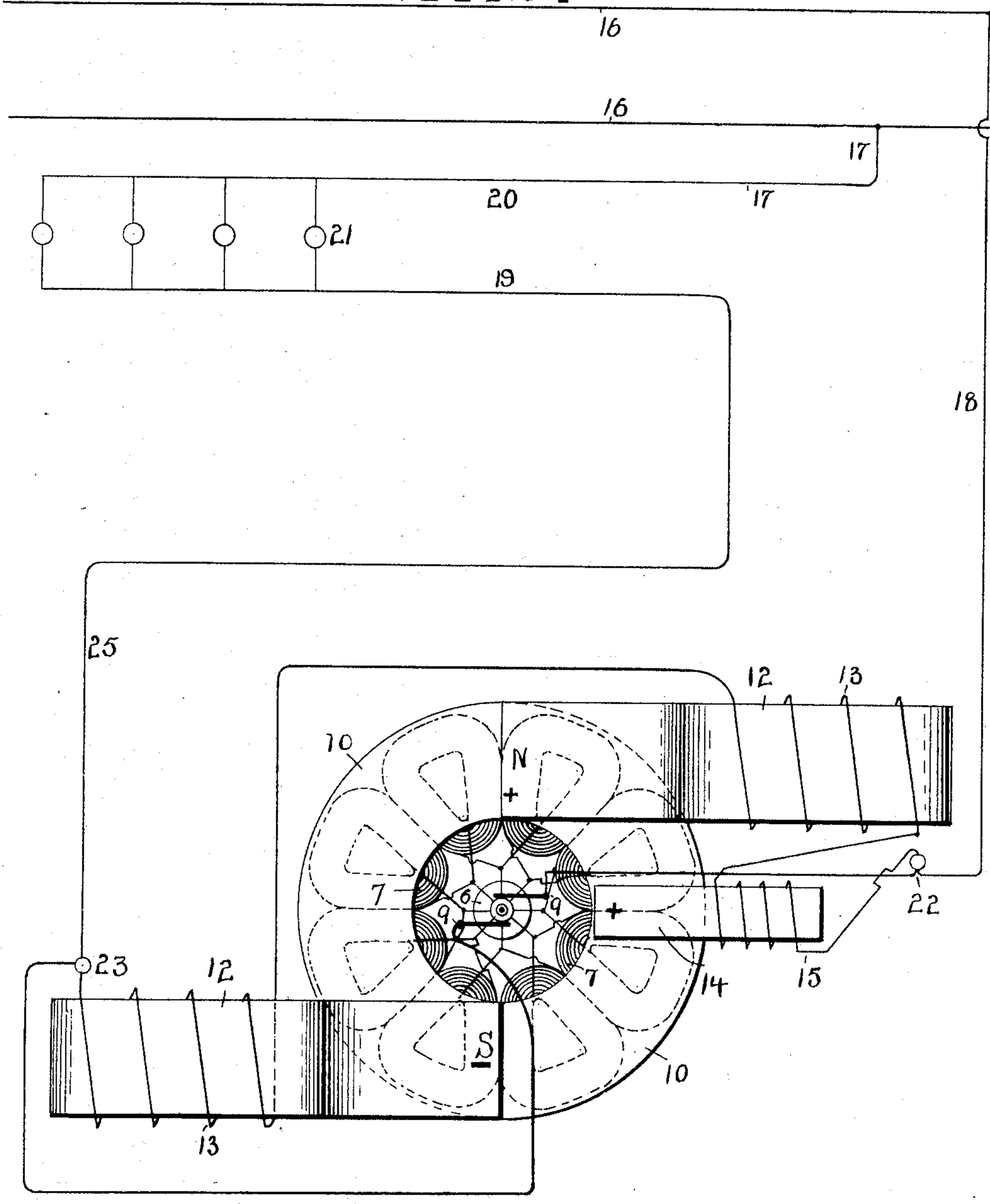
FIG. 2.



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UNITED STATES PATENT OFFICE.

ROGER S. WHITE, OF NEW YORK, N. Y.

ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 624,141, dated May 2, 1899.

Application filed September 2, 1898. Serial No. 690,129. (No model.)

To all whom it may concern:

Be it known that I, ROGER S. WHITE, a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented certain new and useful Improvements in Electric Meters, of which the following is a specification.

My invention relates to various new and useful improvements in electric meters of the type employing an electric motor influenced, by the current to be measured and operating a register-train, the motor-armature being provided with a retarding device influenced preferably, by the motor field-magnets and by means of which the proper load upon the motor will be secured.

The object of my invention is to provide a meter of this type capable of very accurate registration and of a simple construction. In order to provide a motor-meter which shall quickly respond to changes in load and which shall accurately register the current, it is desirable that the armature should be very light and that the magnetic field should be as intense as possible. At the present time motor-meters are made employing a retarding device which comprises a disk of non-magnetic metal carried by the armature-shaft and in some instances forming a base or support for the armature-coils. This disk is influenced either by the field-magnets of the motor or by a separate magnet or magnets. The employment of a disk of non-magnetic metal on the armature-shaft makes the armature unduly heavy, so that it does not quickly and accurately respond to changes in the current. In order to overcome this difficulty and to make an armature as light as possible, I employ a flat annular ring as a retarding device, the extent of surface of such ring being substantially equal to the magnetic field in which it rotates. By employing a non-magnetic annular ring instead of a disk, as heretofore used, I am enabled to save a considerable portion of unnecessary metal, and I am thereby enabled to make the armature of a minimum weight. The armature-coils of my improved motor-meter are preferably carried on a flat non-metallic support, such as a sheet or disk of mica, and the flat annular ring which constitutes the retarding device is preferably secured to such non-metallic disk either on top of the armature-coils or on the opposite side of the disk from the armature-coils, whereby a very light armature will be secured which can be made of a relatively large diameter and will be subject to all changes in the current to be measured.

In motor-meters as now constructed it is the custom to employ permanent field-magnets for effecting the rotation of the armature. When such permanent field-magnets are employed, it has been found that abnormal conditions, such as short-circuiting or reversal of the current, affects the magnetism and thereby influences the operation of the meter. With permanent field-magnets it has been found impossible to secure intense magnetic fields, since an intensely-magnetized permanent magnet quickly loses its magnetism, and consequently the rotative effect of the armature under the influence of a definite amount of current would be gradually decreased, so that the motor would be inaccurate. It is therefore the custom in motor-meters as now constructed to first intensely magnetize the permanent field-magnets and to then weaken such magnetism in order to obtain a relatively constant magnetic field. As stated, therefore, at the present time it is neither possible to employ armatures of a minimum lightness, nor is it possible to obtain field-magnets of a maximum strength, so that the present meters do not respond accurately and instantly to changes in the current which influence them.

In order to overcome the objections before noted to the employment of permanent field-magnets, I provide the field magnet or magnets of my improved meter with a coil thereon by which the permanent magnetism will be retained and by which an intensely-magnetic field may be secured. In order to effectively regulate the speed of rotation of my improved motor-meter, I prefer to employ in conjunction with the permanent field-magnets one or more retarding-magnets having windings thereon and arranged at the neutral point or points on the armature between the field-magnets, whereby such retarding magnet or magnets will additionally serve to retard the speed of rotation of the armature by their action upon the retarding device. By varying the number of turns of the coil

or coils on the retarding magnet or magnets it is possible to very accurately regulate the retarding effect and to thereby secure a motor-meter wherein the armature will instantly and accurately respond to and indicate changing currents which may influence it, making it unnecessary to change the more expensive windings on the permanent field-magnets.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view showing one field-magnet and illustrating the preferable construction of armature and commutator, and Fig. 2 a diagrammatic view illustrating the electric connections.

In both of the above views corresponding parts are represented by the same numerals of reference.

1 represents a shaft mounted in a suitable framework and preferably on cone or jewel bearings, so as to rotate with a minimum friction. This shaft is provided with a worm 2 at its upper end, which operates the register-train, (not shown,) or it may operate the register-train in any suitable way. Carried upon the shaft 1 is a sleeve 3, secured thereto by a set-screw 4 or in any suitable way.

5 is a thin disk of non-metallic material, preferably mica, which constitutes the body or support of the armature. This disk is made as thin as possible, so that an armature of great lightness will be secured. The disk 5 is secured to the sleeve 3 in any suitable way—as, for example, by a washer 6. The disk 5 carries the armature-coils 7, which are arranged flat upon the disk and secured in place by an adhesive substance, such as shellac. The coils connect to a commutator 8, made of as small diameter as possible, and bearing upon said commutator are the two brushes 9 9, mounted in any suitable way Both the bars of the commutator 8 and the brushes 9 9 are heavily gold-plated, whereby I avoid any tendency of oxidation and secure bright contact-surfaces at all times.

10 represents the retarding device, which preferably comprises a flat annular ring, as shown, which ring is made of a non-magnetic metal, such as aluminium. I prefer to make the retarding device 10 of aluminium in order that the rotating parts of the armature may be made of a minimum lightness. Preferably the flat annular ring 10 is mounted on the coils 7 of the armature and is secured in place thereto in any suitable way—such, for example, as by the small spring-clips 11, which clamp the ring in place. Instead of using clips for this purpose it will of course be seen that the retarding-ring 10 may be secured in place by means of an adhesive substance, by rivets, or in any other suitable way. It is not necessary that the retarding-ring 10 should be placed on top of the coils 7, as explained, since said retarding-ring may be secured on the under side of the disk 5, as will be understood. It will of course be further understood that the retarding-ring may be mounted elsewhere on the shaft than in conjunction with the motor-armature and be affected by separate and independent retarding-magnets. It is preferable, however, that the retarding-ring should be carried on the armature, as by such a construction I am enabled to make the armature of a minimum lightness and to utilize the field-magnets of the motor for the purpose of opposing the retardation of the armature.

12 12 represent the field-magnets of the motor, which are preferably arranged tangentially to the armature, as shown in Fig. 2, and which may be of any suitable construction. These field-magnets are permanently magnetized, and their fields are as intensely magnetic as can be secured. In order to prevent the field-magnets from losing their magnetism in use, I provide each magnet with a separate coil 13 thereon, by means of which the permanent magnetism will be always maintained of a constant intensity.

My improved meter will be adjusted to the proper standard by varying to the correct extent the retarding effect upon the retarding device. This regulation may be thus effected by varying the length of turns of the coil or coils 13. I prefer, however, to make the permanent magnets 12 and their coils always of a constant standard and to utilize one or more separate retarding-magnets 14, coöperating with the armature on the neutral line between the two field-magnets. In Fig. 2 I illustrate one of these retarding-magnets; but it will be obvious that two of them may be used at diametric points on the armature. The retarding-magnets 14 are somewhat smaller than the field-magnets 12. They are permanently magnetized and they are provided each with a coil 15 thereon, the lengths or number of turns of which may be varied to adjust the speed of rotation of the armature to the correct point.

In connecting my improved motor-meter in circuit I prefer to adopt the arrangement illustrated in Fig. 2. 16 16 represent the supply-mains, 17 and 18 the branches leading therefrom, and 19 20 the consumption-circuit, having the translation devices 21 therein. The branch 18 leads to a binding-post 22, and the two coils 13 of the field-magnets will be connected in series with each other and with the coil or coils of the retarding magnet or magnets between said binding-post 22 and a second binding-post 23, as shown. The brushes 9 of the motor-armature are connected in a separate shunt 24 across said binding-posts, as shown. A wire 25 connects the binding-post 23 with the consumption-main 19.

In operation the circuit including the permanent field-magnet coils takes the place of a separate shunt necessary in meters of this type employing simple permanent field-magnets. By making use of permanent field-magnets each with a separate coil thereon,

by which its magnetic field may be always maintained of a relatively high intensity, and by employing an armature of the type described having a retarding device carried thereby, comprising a flat annular ring, I am enabled to obtain a motor-meter which will respond with great accuracy to variations in the current, since the armature is of a minimum lightness and the fields of a maximum strength.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In an improved motor-meter, the combination of an armature influenced by the current to be measured, a retarding device for imposing a load upon the armature, a permanent field-magnet with respect to which the armature rotates, and a magnetizing-coil on such field-magnet, substantially as set forth.

2. In an improved motor-meter, the combination of an armature influenced by the current to be measured, a retarding-ring for imposing a load upon the armature, a permanent field-magnet with respect to which the armature rotates, and a magnetizing-coil on such field-magnet, substantially as set forth.

3. In an improved motor-meter, the combination of an armature influenced by the current to be measured, a retarding-ring for imposing a load upon the armature, a permanent field-magnet with respect to which the armature rotates, said retarding-ring also operating in the field of such permanent field-magnet, and a magnetizing-coil on such field-magnet, substantially as set forth.

4. In a motor-meter, the combination with an armature influenced by the current to be measured, of a field-magnet with respect to which the armature rotates, a retarding device carried by the motor-armature and influenced by the field of the permanent field-magnet, and a separate retarding-magnet arranged at the neutral point on said armature and also influencing the retarding device, substantially as set forth.

5. In a motor-meter, the combination with an armature influenced by the current to be measured, of a field-magnet with respect to which the armature rotates, a retarding-ring carried by the motor-armature and influenced by the field of the permanent field-magnet, and a separate retarding-magnet arranged at the neutral point on said armature and also influencing the retarding-ring, substantially as set forth.

6. In a motor-meter, the combination with an armature comprising a flat disk of non-metallic material, of armature-coils carried by said disk, a field-magnet with respect to which the armature rotates, and a retarding-ring for retarding the rotation of said armature, substantially as set forth.

7. In a motor-meter, the combination with an armature comprising a flat disk of non-metallic material, of armature-coils carried by said disk, a field-magnet with respect to which the armature rotates, and a retarding-ring influenced by the field of said field-magnet for retarding the rotation of said armature, substantially as set forth.

8. In a motor-meter, the combination with an armature comprising a flat, non-metallic disk, armature-coils carried by said disk and a flat, non-magnetic retarding-ring carried by the armature, of a field-magnet with respect to which the armature rotates, said field-magnet also influencing the retarding-ring, substantially as set forth.

9. In a motor-meter, the combination with an armature comprising a flat, non-metallic disk, armature-coils carried by said disk, and a flat, non-magnetic retarding-ring secured to said flat, non-metallic disk above the armature-coils, of a field-magnet with respect to which the armature rotates, said field-magnet also influencing the retarding-ring, substantially as set forth.

10. In a motor-meter, the combination with an armature comprising a flat, non-metallic disk, armature-coils carried by said disk, and a flat, annular, retarding-ring made of aluminium, of a field-magnet with respect to which the armature rotates, said field-magnet also influencing the retarding-ring, substantially as set forth.

This specification signed and witnessed this 25th day of August, 1898.

ROGER S. WHITE.

Witnesses:

FRANK L. DYER,

JNO. R. TAYLOR.