M. J. WOHL & H. HERTZBERG.

ELECTROMAGNET COIL CONSTRUCTION.

APPLICATION FILED APR. 21, 1908.

931,540.

Patented Aug. 17, 1909.

2 SHEETS—SHEET 1.

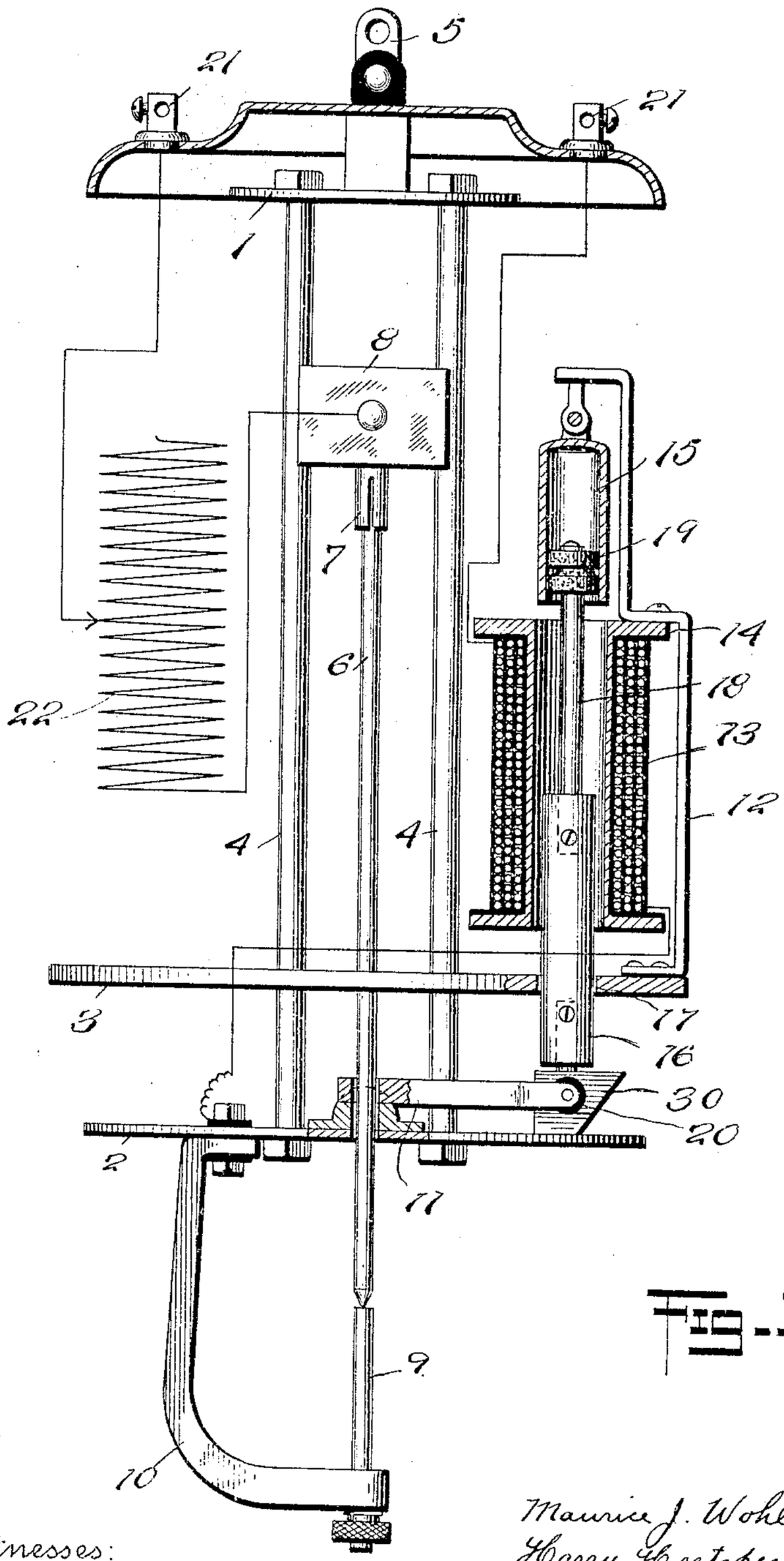

FIG. 1.

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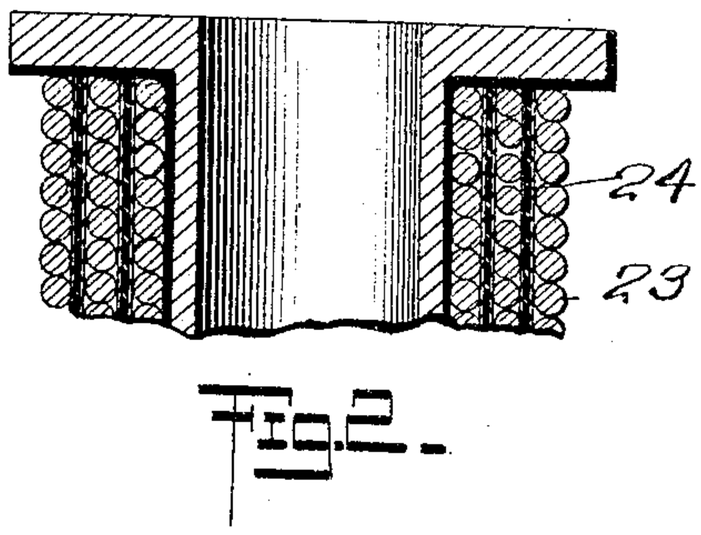

Fig. 2.

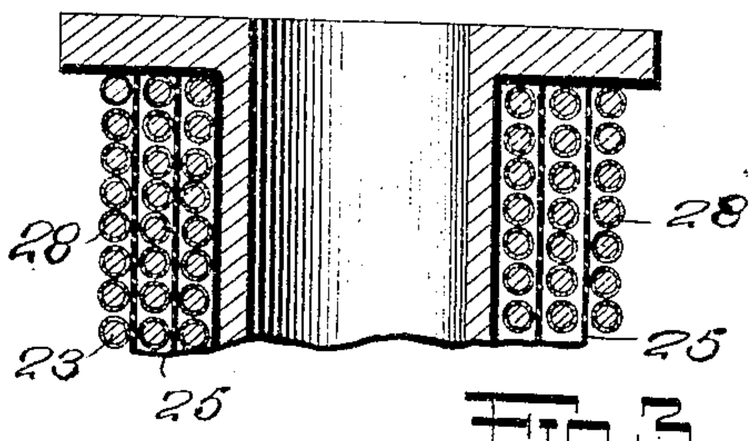

Fig. 3.

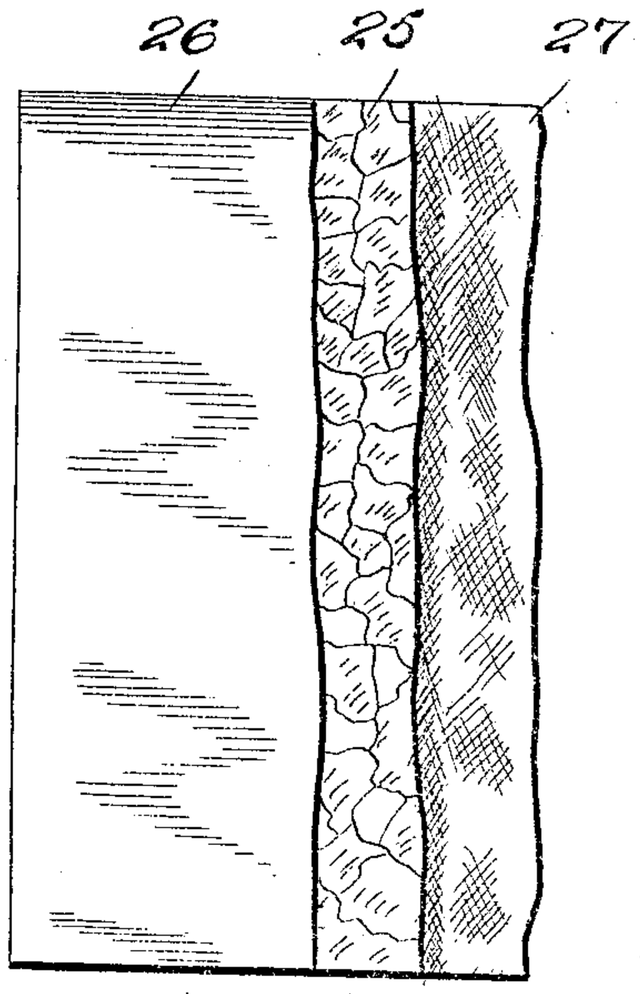

Fig. 4.

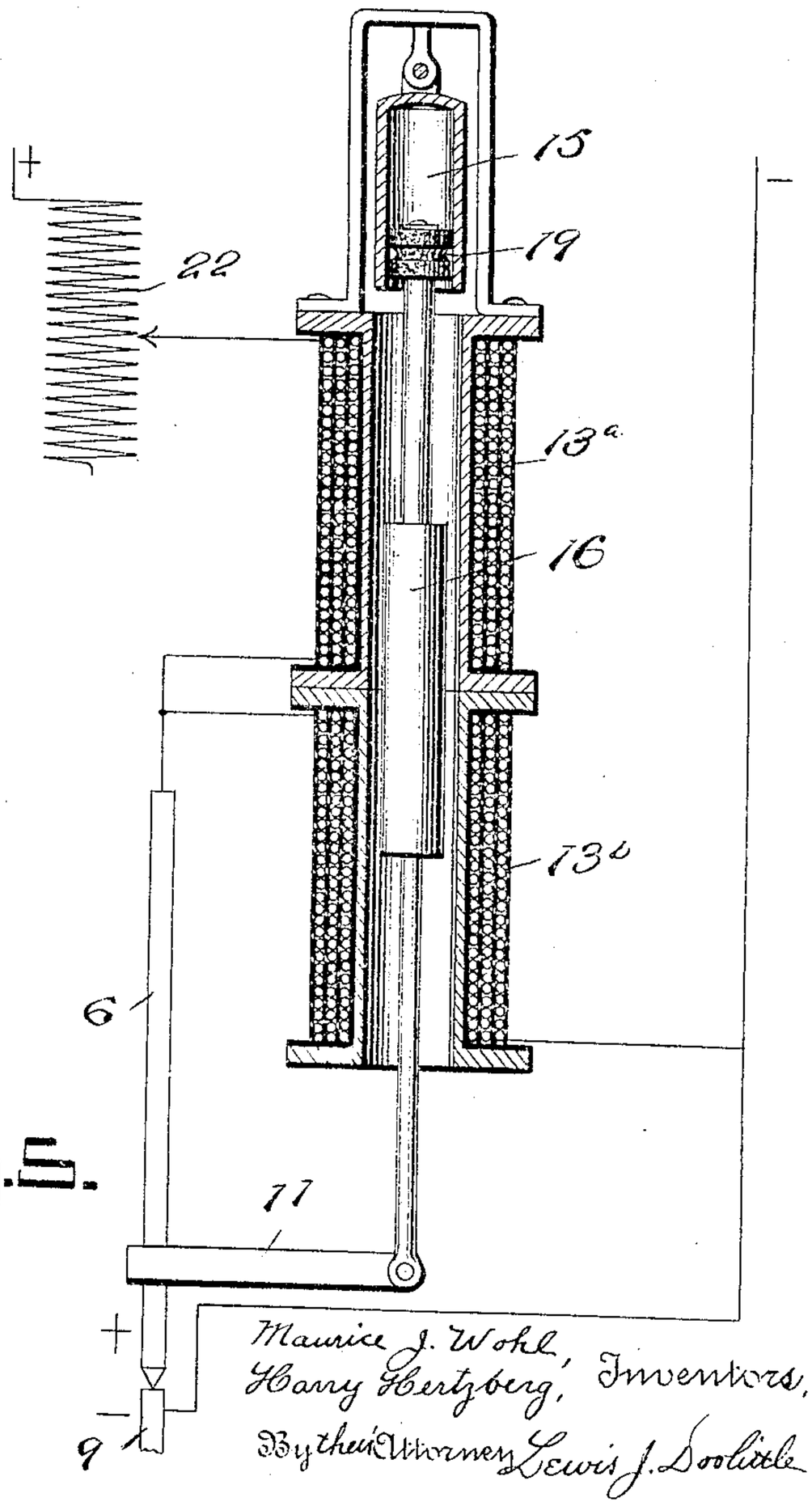

Fig. 5.

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UNITED STATES PATENT OFFICE.

MAURICE J. WOHL, OF NEW YORK, AND HARRY HERTZBERG, OF BROOKLYN, NEW YORK, ASSIGNORS TO ABBOT A. LOW, OF HORSESHOE, NEW YORK, MAURICE J. WOHL, OF NEW YORK, N. Y., AND HARRY HERTZBERG, OF BROOKLYN, NEW YORK, TRUSTEES.

ELECTROMAGNET-COIL CONSTRUCTION.

No. 931,540. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed April 21, 1908. Serial No. 428,401.

To all whom it may concern:

Be it known that we, MAURICE J. WOHL and HARRY HERTZBERG, citizens of the United States, and residents, respectively, of the city of New York, borough of Manhattan, county and State of New York, and of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Electromagnet-Coil Construction, of which the following is a specification.

This invention relates to arc lamps, and the object of the invention is to provide certain improved means for controlling the movable electrode.

The invention consists in certain improvements wherein a solenoid and core control the movable electrode, and also in the construction of and method of constructing solenoids or coils.

In the drawings, Figure 1 is an elevation of a lamp with casing removed embodying the invention; Fig. 2 is a partial vertical section through the solenoid as constructed; Fig. 3 is a similar view illustrating the condition of the solenoid after some use; Fig. 4 shows the composite insulating strip; and Fig. 5 is a semi-diagrammatic view showing the invention applied to a differential coil lamp.

Referring to these drawings, the frame of the lamp may be composed of the top plate 1, the bottom plate 2, the intermediate platform 3, and a pair of vertical guide rods 4 connecting said plates and platform. A hanger 5 may be connected to but insulated from the top plate 1.

6 is the upper, movable electrode, which passes through alined apertures in plate 2 and platform 3 and is held at its upper end in a suitable tubular holder 7, which is, in turn, carried by the block 8 mounted slidably between the rods 4.

9 is the lower, fixed electrode, which is held by the bracket 10 depending from the plate 2.

The immediate instrumentality for controlling the electrode 6 may be a clutch loop 11. However, no novelty is claimed for this clutch loop *per se;* nor, indeed, do the features already recited constitute part of the novelty of the present invention.

12 is an upright frame support, which may be employed, and which may be secured to, but suitably insulated from, the platform 3. This support may carry a coil or solenoid 13, wound on the spool 14 secured to said support. The support may also have depending from its upper end a dashpot 15, preferably of brass.

Longitudinally movable within the solenoid 13 is an iron core 16, which passes through an aperture 17 in the platform 3. To the upper end of this core may be secured, as by a stem 18, a graphite plunger 19, which works within the shell or dashpot 15. Of course, the plunger need not be entirely of graphite.

The lower end of the core 16 may carry a weight 30, which also serves as a stop, by engaging the lower surface of the platform 3, to prevent undue upward movement of the core.

The clutch loop member 11 is pivotally connected to the core 16, very conveniently to the weight 30; insulation 20 being provided at the pivotal joint.

The current enters at one of two binding posts 21, conveniently disposed at the top of the lamp, and passes out at the other. The portion of the circuit within the lamp includes the variable resistance 22, the upper electrode 6, the lower electrode 9, the bracket 10, and the solenoid 13. In operation, as will be readily understood, when the current becomes too weak, owing to the burning away of the electrodes, the magnetic field of the solenoid is weakened, permitting the core to descend, and the clutch loop 11 to assume a substantially horizontal position, when the clutch ceases to bite upon the upper electrode and the latter descends. If the arc is too intense, the heavier current passing through the solenoid causes the latter to draw the core upward, thus tilting the clutch loop 11, until the latter bites upon the upper electrode and finally lifts the latter bodily. During these operations, the dashpot 15 serves to regulate the movement and to guide the core.

The construction of the solenoid 13 is of striking novelty. The wire 23 of which this solenoid is formed is aluminum; and the wire itself is not covered with insulation in the first place, nor is insulation disposed between the superposed turns of wire. Between the successive layers or cylinders of the solenoid, however, is placed an insulation, consisting of a composite strip 24, shown

more particularly in Fig. 4. The insulating portion of this strip is the central layer of mica 25; and the inclosing layers 26 and 27 are both of paper, or the one of paper and the other cloth. Even both might be of cloth. No specific novelty is claimed for this composite strip, as it is known in the electrical world; but its use in the present connection is regarded as entirely new. A solenoid or coil constructed in this manner has strikingly new properties. Fig. 2 represents the construction of the solenoid; Fig. 3 indicates the condition of the coil after some use. It should be observed, in the first place, that aluminum wire oxidizes readily. Even before current is sent through, the wire may begin to be covered by a layer of aluminum oxid, represented at 28. After current has passed for some time, this coating of aluminum oxid is of sufficient density to afford a thoroughly satisfactory insulating envelop for the wire. In addition, the heat developed within the solenoid burns away the layers 26 and 27 of the composite strip, leaving the mica 25. This affords more room within the solenoid, permitting the turns of wire to separate somewhat, thus enhancing the insulating effect.

Fig. 5 indicates the applicability of the invention to the differential coil type of lamp. In these, as is well known, one solenoid, here designated 13^a is in series with the electrodes, while the other solenoid, here designated 13^b is in shunt across the arc. The two exert opposite pulls upon the core 16. When the arc voltage gets too high, a larger amount of current passes through the shunt coil and in due time the core is drawn down and a predetermined arc is maintained. With the ordinary constructions of coils or solenoids, the shunt coil, which is of finer wire than the series coil, being designed to carry less current under normal conditions, is liable to burn out or to have its insulation damaged, in event that the movable electrode is caught and held in an elevated position, which results in the continued passage of a large amount of current through the shunt. In order to obviate this danger, it has been customary hitherto to provide an automatic circuit breaker, which becomes operative when the electrodes are accidentally held separated. For this type of lamp, the present invention is particularly valuable. In the first place, aluminum is of lower conductivity than copper; hence the shunt coil need not be of particularly fine wire, which lessens materialy the danger of burning out. Further, the aluminum oxid affords a most efficient insulation between the superposed turns, particularly when aided by the spaces left between the turns after the solenoid has been in use, as already described; and the mica between the cylinders or layers is practically a perfect insulator.

While the description hitherto has been directed to the preferred form of solenoid or coil, in which the wire used is aluminum, and the insulating envelop is one of naturally formed aluminum oxid, it should be understood that the invention is not limited in this respect to aluminum wire and aluminum oxid, but comprehends as well any solenoid or coil construction in which the wire, of whatever metal or alloy, is naturally or artificially coated with an insulating envelop of oxid. Thus, copper wire may be employed, and coated artificially with oxid.

What is claimed as new is:

1. A solenoid or coil adapted for use in an arc lamp, said solenoid being wound with aluminum wire and comprising a plurality of layers, and insulation between said layers consisting of a composite strip, said strip having a central layer of insulating material and outer layers of readily combustible material.

2. A solenoid or coil adapted for use in an arc lamp, said solenoid being wound with aluminum wire and comprising a plurality of layers, together with a composite insulating strip between said layers, said strip comprising a central layer of mica and outer layers of readily combustible material.

3. The method of making a solenoid, which consists in winding successive layers of bare aluminum wire, and placing between the layers a composite insulating strip, consisting of a central layer of insulating material and covering layers of readily combustible material.

4. A solenoid or coil wound with aluminum wire without artificial insulation between the convolutions, and having between the cylindrical layers a composite insulating strip composed of a central layer of mica and outer layers of readily combustible material.

5. A solenoid or coil adapted for use in an arc lamp, said solenoid being wound with aluminum wire without artificial insulating covering, and with a composite insulating strip between the cylindrical layers, composed of a central layer of mica and outer layers of readily combustible material.

Signed at Brooklyn, New York, in the county of Kings and State of New York, this 16 day of April, 1908.

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