C. W. EISENMANN.

SAFETY DEVICE FOR ELECTRIC LAMPS.

APPLICATION FILED APR. 16, 1909.

955,777. **Patented Apr. 19, 1910.**

Fig. 1.

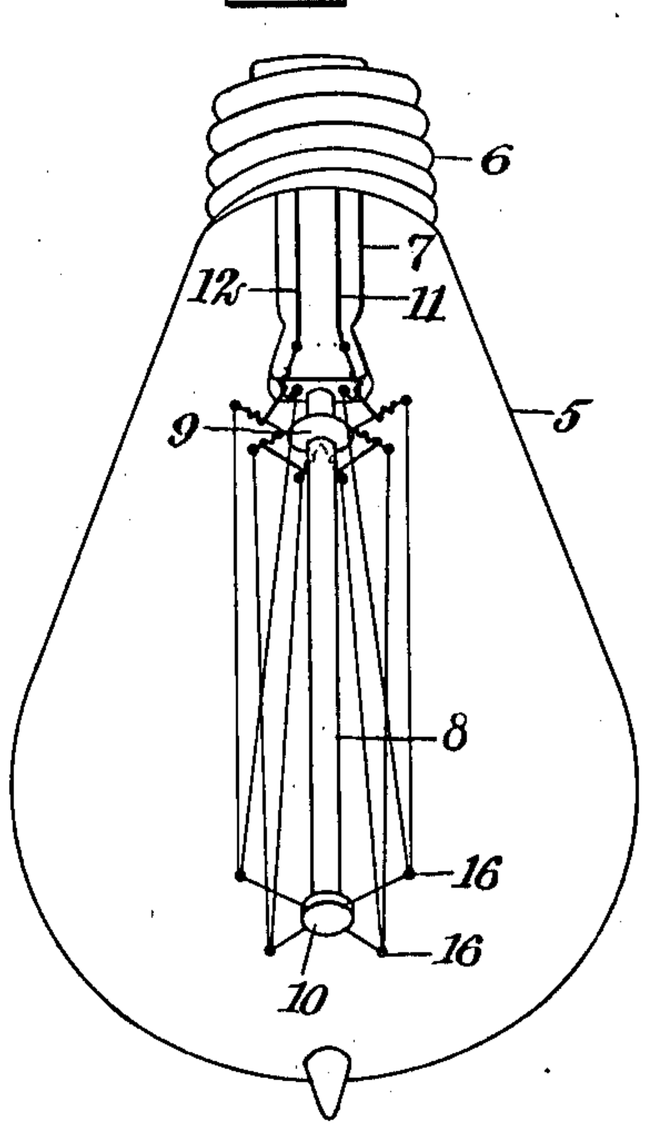


Fig. 2.

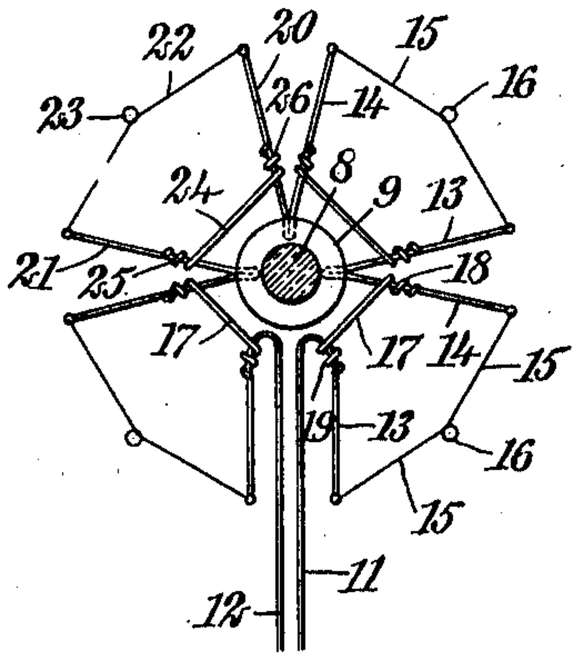


Fig. 3.

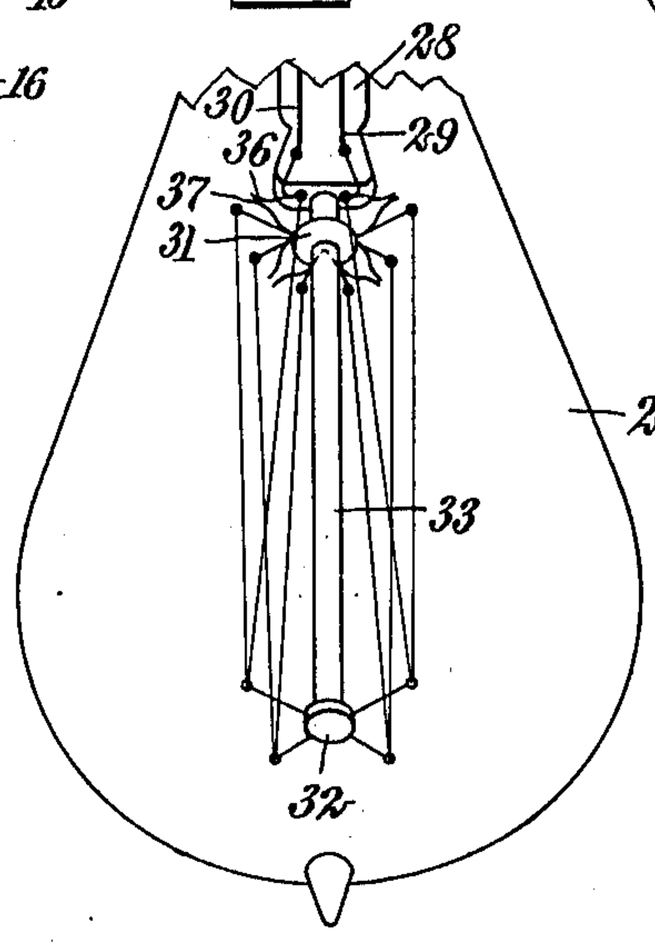
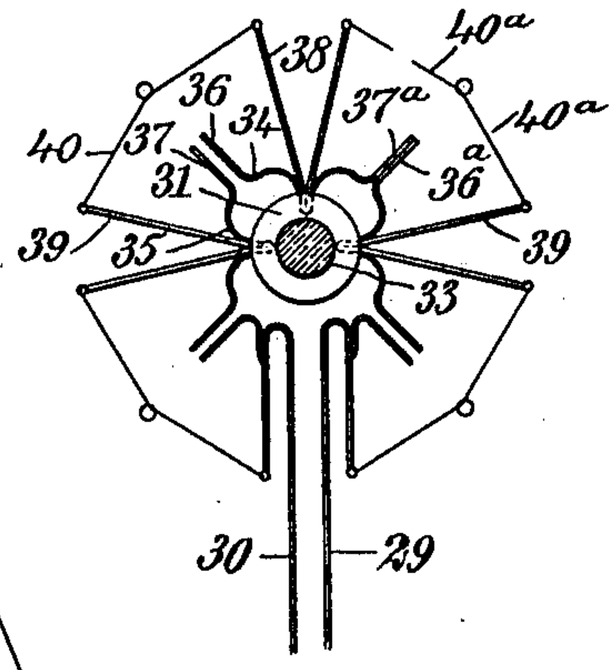


Fig. 4.



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SAFETY DEVICE FOR ELECTRIC LAMPS.

955,777. Specification of Letters Patent. **Patented Apr. 19, 1910.**

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To all whom it may concern:

Be it known that I, CARL W. EISENMANN, a subject of the German Emperor, and a resident of Kansas City, in the county of Jackson and State of Missouri, have invented a new and Improved Safety Device for Electric Lamps, of which the following is a full, clear, and exact description.

My invention relates to safety devices for incandescent lamps using filaments or other incandescent members; my more particular purpose being to continue the activity of the lamp in case a filament or its equivalent is broken, which would ordinarily extinguish the light altogether.

My invention comprehends especially lamps using filaments or filamentary wires made of tantalum, tungsten, or other rare metals, as well as ordinary carbon filaments.

As is well known in this art, there is a marked tendency to substitute metallic filaments for filaments of carbon. The metallic filaments produce excellent results in the matter of light produced at a given cost, but are exceedingly brittle and expensive to replace. Moreover, in filaments of the type now under discussion, it is usual either to connect together in series a considerable number of filaments or to mount the filament in a continuous length, and if any one of the series of filaments or any part of the continuous filament is broken, the entire lamp is rendered useless. What I seek to do, therefore, in this invention, is to provide a lamp with a filament so mounted on supports that if the filament breaks between any two supports, that particular section is short-circuited so that the current may continue through the remainder of the filament.

While the general purpose of my invention may be accomplished in a large number of ways, and it is impracticable to show them all, I disclose two particular constructions of lamp made in accordance with my invention.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a perspective of an incandescent lamp having tantalum filaments and made in accordance with my invention; Fig. 2 is a view partly sectional and partly diagrammatic, showing the arrangement of the filaments and of the wires of latent conductors used for short-circuiting them; Fig. 3 is a fragmentary perspective showing a type of tantalum lamp a little different from that appearing in Fig. 1, the filaments in this instance being controllable by the electrostatic attraction of metallic leaves used for short-circuiting them under proper conditions; and Fig. 4 is a view somewhat similar to Fig. 2, but disclosing the construction appearing in Fig. 3.

At 5 is an exhausted globe which is connected with a socket stem 6 whereby it is supported. Disposed within the globe and mounted upon the socket stem is a glass pedestal 7 and extending from the latter is a stem 8 provided with beads 9, 10, the stem 8 and the beads mentioned being integral with each other and with the pedestal 7. The leading-in wires for the bulb are shown at 11, 12 in Fig. 1 and are sealed into the glass of the pedestal 7. A number of metallic supporting pins 13, 14 are sealed into the bead 9. For convenience in mounting, one of these pins 13 is integral with another 14, thus forming a member having substantially a V shape.

At 15, 15 are shown a number of filaments of rare metal, such as tantalum or tungsten, each filament being connected with the supporting pins 13, 14. Sealed into the bead 10 are a number of supporting pins 16 disposed radially and engaging the middle portions of the respective filaments. At 17, 17 are a number of thin aluminum or magnesium wires slightly oxidized and provided with portions 18 which are wound around the pins 13, 14, as indicated particularly in Fig. 2. At 20, 21 are two supporting pins, and connected with the same is a filament 22, the middle of this filament being engaged by a supporting pin 23. The supporting pins 20, 21 are connected together by a wire 24 having its ends 25, 26 wound around the supporting pins 20, 21. The supporting pins 20, 21, filament 22, supporting pins 23 and wire 24 correspond with the supporting pins 13, 14, the filament 15, the supporting pins 16 and the wire 17, with the exception that the filament 22 is broken and the associated parts just mentioned are therefore placed in a somewhat different relation.

The operation of the device shown in Figs. 1 and 2 is as follows: Suppose that the filament is intact and that the current is turned

on, as in the case of any other incandescent lamp. The filament glows and produces the light desired. The current now passes in series through all of the various sections of filaments. The wires 17 being oxidized upon their peripheral surfaces as stated, are non-conductors. Suppose, now, that one of the filaments, say the one numbered 22, breaks as indicated in Fig. 2. The consequence is that the corresponding wire 24 is subjected to a greater potential strain than before. Hence, the delicate insulation formed by the slight coating of oxid upon its outer surface breaks down under the increased electrical pressure, a slight fusion takes place between the wire 24 and the pins upon which it is mounted, and the wire 24 becomes, in effect, metallically connected to the supporting pins 20, 21. It now acts as a conductor and short-circuits the filament 22, allowing all of the other filaments 15 to glow as if nothing has happened.

As only a very short period—usually a second or two, at the outside—is required in order for the current to cause the ends of the wire 24 to become connected with the supporting pins 20, 21, the lamp is not dim except for a moment.

In the form shown in Figs. 3 and 4, the globe appears at 27, the pedestal at 28 and the leading-in wires at 29, 30, the latter being sealed into the pedestal. Two glass beads 31, 32, integral with the glass stem 33, are supported by the pedestal 28. Mounted upon the glass bead 31 are leaves 34, 35 of exceedingly thin metal, preferably platinum foil, gold leaf, or some other metal made exceedingly light, thin and resilient. These leaves are provided with portions 36, 37 and are so arranged that the portion 36 of one leaf and the portion 37 of another leaf are exceedingly close together and are adapted to be drawn into contact with each other by electrostatic attraction when the difference in potential between them exceeds a certain predetermined limit. At 36^a, 37^a is shown a pair of these leaves drawn into contact with each other. At 38, 39 are supporting pins and connected with the same are filaments 40, 40^a. Otherwise the construction is the same as in Figs. 1 and 2.

The operation of the device shown in Figs. 3 and 4 is as follows: The current being turned on, the various filaments 40, 40^a are normally aglow. As the current is passing uniformly, there is a little electrostatic attraction between each leaf 36 and the adjacent leaf 37, but this attraction is not sufficient to draw the leaves just mentioned into contact. Suppose, however, that a filament—for instance, the one numbered 40^a, Fig. 4—breaks, as indicated in this figure. The difference in potential between the leaves 36^a, 37^a now becomes considerably greater than before, and approximates the difference in potential of the line terminals. The leaves 36^a, 37^a are thereby drawn directly into metallic contact, thereby short-circuiting the filament 40^a, immediately restoring the conductivity of the lamp as a whole, the filament 40 being caused to glow, so that there is comparatively little interruption brought about by the rupture of a filament.

I do not limit myself to any particular materials to be used for the purposes above stated. This is particularly the case with reference to the materials employed as filaments and the substances used for the conducting members 17, 24, and the materials used in the formation of the leaves 36, 37, 36^a, 37^a. Neither do I limit the disclosed construction to lamps designed for multiple connection, since this construction is admirably suited for lamps designed for series connection and differing from known devices similar in principle in being less complicated and less expensive, and located inside the inclosing bulb of the lamp.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a lamp, the combination of supporting pins, a filament mounted thereupon and adapted to glow, means for sending a current through one of said supporting pins and through said filament to the other of said supporting pins, and a conducting wire slightly insulated and wound partially upon said supporting pins, so as to normally insulate the same and yet to establish electrical communication between said supporting pins under proper changes of electrical conditions in said supporting pins.

2. In a lamp, the combination of supporting members, a filament supported by said supporting members, and a conducting wire slightly oxidized and adapted to be fused thereto when the current through said wire is increased by the breaking of said filament.

3. In a lamp, the combination of supporting members, a filament mounted thereupon and adapted to glow, and a conducting member extending from one of said supporting members to the other, said conducting member being slightly insulated upon its outer surface for the purpose of temporarily serving as an insulator but adapted to increase in conductivity when subjected to an excessive difference in potential.

4. In a lamp, the combination of supporting members, a filament connected therewith and adapted to glow, and a single wire extending from one of said supporting members to the other, said wire being slightly insulated from said supporting members so as to normally insulate the same and yet to establish electrical communication between said insulating members under proper

changes of electrical conditions in said supporting members.

5. In a lamp, the combination of supporting members, a filament mounted thereupon and adapted to glow, means for sending a current through one of said supporting members and through said filament to the other supporting member, and a conducting wire, provided with a film of oxid, which engages said supporting members and normally insulates the same.

6. In a lamp, the combination of supporting members, a filament extending from one of said supporting members to another, and mechanism connected electrically with said supporting members and controllable directly by excessive differences in potential for short-circuiting said supporting members.

7. In a lamp, the combination of supporting pins insulated from each other, a filament extending from one of said supporting pins to another, said filament being adapted to glow, and means controllable by differences in potential of said pins for short-circuiting the latter.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CARL WILLIAM EISENMANN.

Witnesses:
W. T. BROCKMAN,
RAY P. STAUFFER.