May 11, 1943. I. E. McCABE 2,318,700

COMBINED INCANDESCENT LAMP AND FLASHER SWITCH

Filed April 27, 1942 2 Sheets-Sheet 1

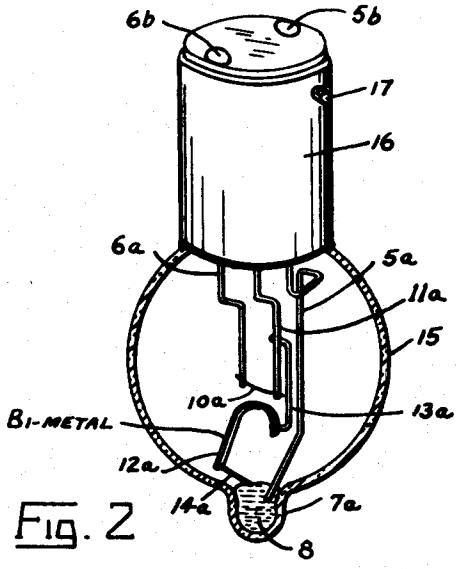


FIG. 2

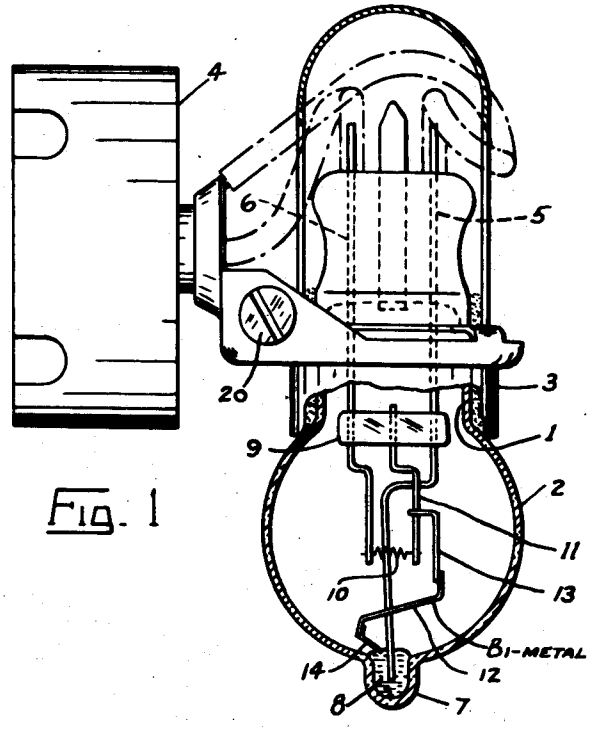


FIG. 1

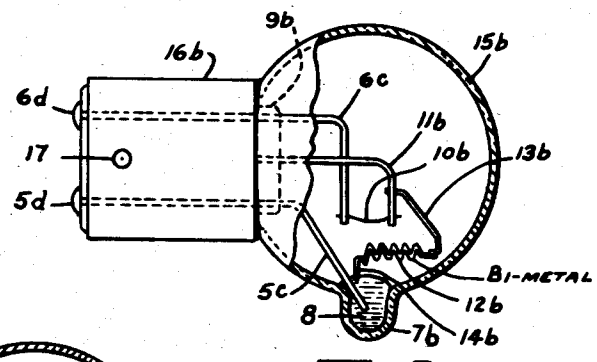


FIG. 3

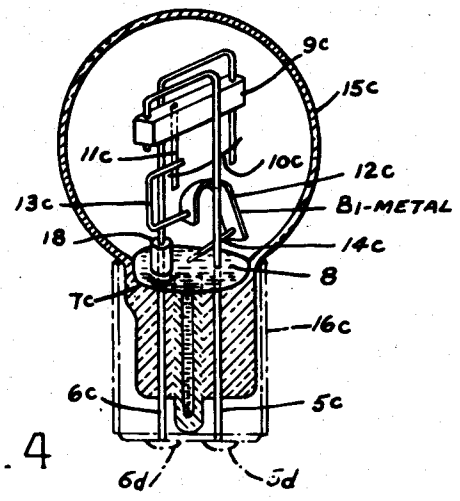


FIG. 4

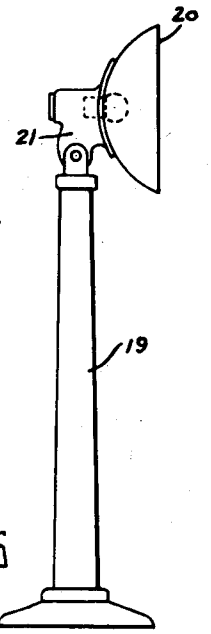


FIG. 5

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COMBINED INCANDESCENT LAMP AND FLASHER SWITCH

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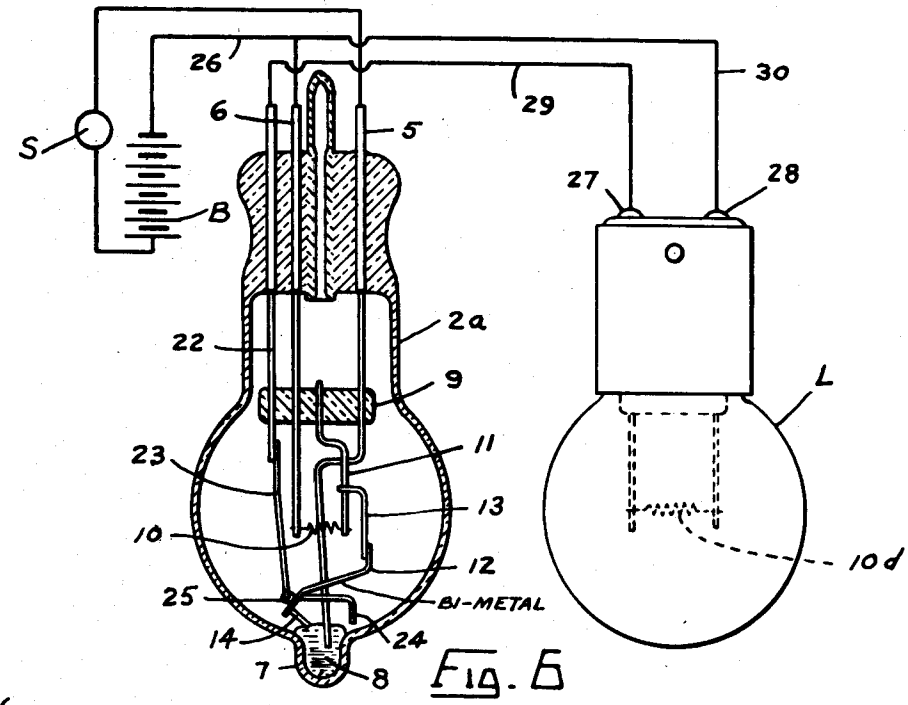


Fig. 6

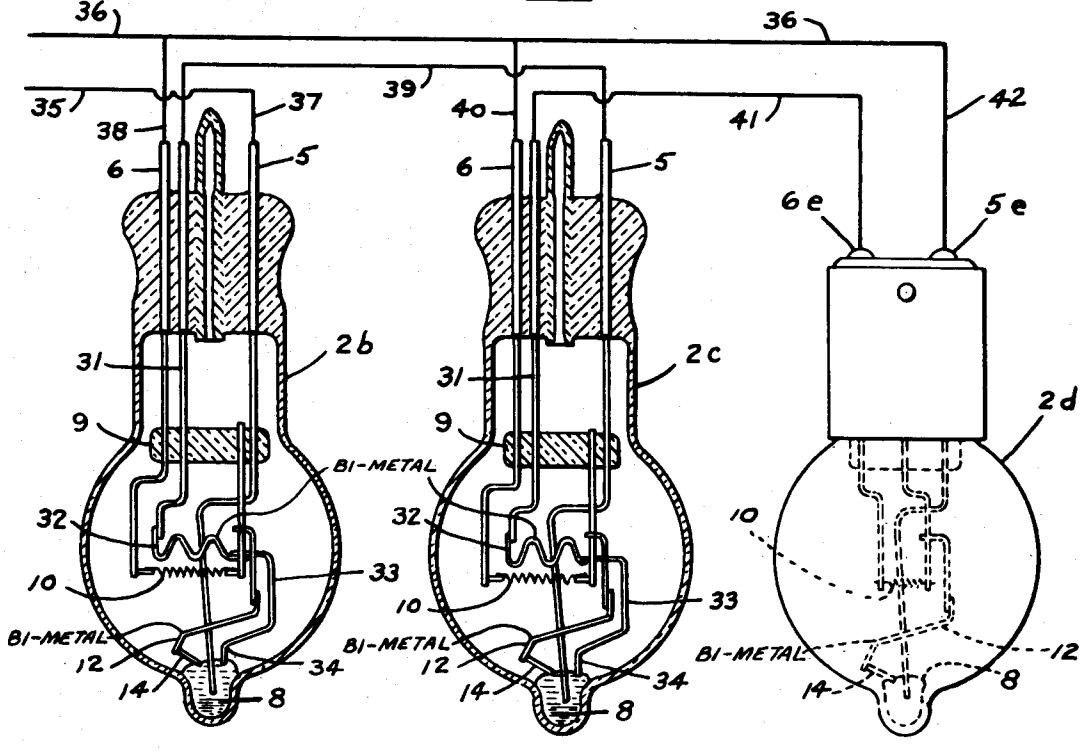


Fig. 7

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2,318,700

COMBINED INCANDESCENT LAMP AND FLASHER SWITCH

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4 Claims. (Cl. 176—24)

This invention relates to improvements in combined incandescent lamp and flasher switches used as signals or markers for air ports, harbors, street intersections or where needed as location, warning or directional indicators.

Devices of this kind now in use generally employ the commercial incandescent electric lamp with various forms of electrically actuated switch mechanisms to cause the lamp to be intermittently energized to produce a flashing effect. Such lamp flashing mechanisms require skilled servicing when out of order. As it is customary in most lamp flashers of this character to employ batteries as the source of electricity for both the lamp and the flashing mechanism, the use of such flashing mechanism shortens the life of the battery and, therefore, requires the employment of a large number of standard size batteries or an extra large size battery to prevent frequent battery replacement.

It is an object of this invention to provide an incandescent electric lamp bulb which also contains a flasher switch mechanism responsive to the heat from the incandescent filament to automatically and continuously open and close the electric circuit through the lamp as long as the lamp is connected in circuit with the source of electricity.

It is another object of this invention to provide an incandescent electric lamp which when connected in circuit with the source of electricity will become incandescent to not only act as a source of light or visual signal, but the heat generated by the filament when incandescent will act upon a bi-metallic thermal switch member to break the circuit to the filament. The bi-metallic thermal member then cools and re-establishes the circuit so that the lamp will automatically create continuous flashes of light.

It is a further object of this invention to provide within the lamp bulb a pool of mercury connected to one side of the lamp circuit, the other side of which is connected to one end of the lamp filament and thence through a heat responsive member when cooled adapted to cause the free end of the member to engage the pool of mercury to complete the circuit therethrough and so arranged that when the filament is energized and becomes incandescent, the heat therefrom acts upon the heat responsive member to withdraw the free end of the member from the pool of mercury to break the circuit through the lamp filament.

The advantages of such a construction are obvious. The source of light and the flashing mechanism are all contained within the lamp bulb. It needs no skilled servicing because when a filament has burned out or the flashing mechanism has been damaged and becomes inoperative, it only requires removing the dead bulb and putting in a new one. The initial cost of this improved combined lamp and flasher switch is considerable less than the cost of a commercial lamp and separate flasher mechanism. It is also more economical to operate.

With these and other objects in view, reference is made to the accompanying sheets of drawings which illustrate preferred forms of this invention with the understanding that detailed changes may be made without departing from the scope thereof.

In the drawings:

Figure 1 is a view in elevation of a form of this improved combined lamp and flasher switch shown supported in a preferable form of mounting with parts of the bulb broken away to show the flasher mechanism.

Figure 2 is a detail view in elevation of another form of this invention with the bulb shown in section.

Figure 3 is a similar view of another form of this invention with a part of the bulb broken away to show the flasher mechanism.

Figure 4 is a view in vertical section taken centrally through still another form of this invention in which the bulb is inverted.

Figure 5 is a view in elevation of a standard or post for a warning signal which employs the type of combined bulb and switch as shown in Figure 3.

Figure 6 is a view in vertical section taken centrally through another form of this invention together with a showing of its use in a circuit arrangement providing for the alternate flashing of two lamp filaments.

Figure 7 is a view in vertical section taken centrally through still another form of this invention and its application in a circuit arrangement which provides for the flashing to be continued by emergency lamps in the event a filament burns out in the first lamp.

In the embodiment of this invention illustrated in Figure 1, the neck or closed end 1 of the bulb 2 is inserted in a sleeve 3 preferably secured thereto by cement. The upper end of the sleeve 3 is supported in a particular form of bracket 4 such as disclosed in the applicant's prior Patent No. 2,171,861, of September 5, 1939, and therefore needs no detailed description beyond possibly the statement that the leading in wires 5 and 6 through the upper sealed end of the bulb 2 are

connected by lead wires to contact members forming a part of the bracket 4.

As seen in this view, the axis of the bulb lies in a vertical plane and the bulb proper is provided with a depending cup 7 in the lower end thereof which contains a pool of mercury 8. The leading in wire 5 is continued through the closed sealed end of the bulb to extend into the cup 7 and be submerged in the mercury 8. A glass bead 9 connects the leading in wires 5 and 6 within the bulb 2 and the leading in wire 6 is connected to one end of an incandescent filament 10, the other end of which is connected to and supported upon the lower end of an electrical conductor 11, the upper end of which is supported in the glass bead 9 preferably between and separated from the leading in wires 5 and 6. A strip of bi-metallic metal 12 responsive to changes in temperature is mounted in spaced relation below the filament 10 and above the upper surface of the mercury 8. The upper end of the bimetallic thermal member 12 is secured to the lower end of a conductor wire 13, the upper end of which is mounted upon the filament support 11. The lower end of the thermal member 12 is provided with a contact member 14 so arranged that when the circuit through the lamp is open and the filament 10 cold, the thermal member 12 will cause its contact member 14 to engage and be submerged in the mercury 8. With the parts in this position, and the bulb connected to a source of electricity, a circuit will be established through the filament to bring it to incandescence to create a source of light and at the same time, the heat from the incandescent filament will act upon the thermally responsive strip 12 to cause it to deform and withdraw the contact member 14 from the pool of mercury which will break the circuit through the lamp and allow the filament 10 to cool. The cooling of the filament again causes the establishment of the electric circuit through the lamp when the contact member 14 engages the pool of mercury 8. This cycle will continue as long as the bulb is connected in circuit with the source of electricity and will therefore produce intermittent flashes of the lamp.

The Patent No. 2,171,861 previously referred to as disclosing the form of support 3 and bracket 4 shown in Figure 1, provides for the rotatable adjustment of the sleeve 3 by an adjusting screw 20. This feature may be utilized in connection with this invention when it is desired to direct the flashes of light in particular directions, in which case the bulb 2 can have a portion of its surface silvered or provided with a reflector and the adjusting screw 20 then used to position the lamp so that the light flashes will be reflected in a particular direction.

Figure 2 illustrates the application of this invention to an electric lamp in which the sealed end of the bulb 15 is contained in the customary lamp base 16 provided with the usual bayonet projections 17 for engagement with a bayonet slotted lamp socket not shown. In this type of lamp, the leading in wires 5^a and 6^a pass through the base and are connected to contacts 5^b and 6^b upon the exterior of the base. The filament 10^a is supported by an electrical conductor 11^a in the same manner as in Figure 1 and the bimetallic strip 12^a is carried on this supported by a conductor wire 13^a in the same manner. In this type, the bimetallic strip 12^a is curved at its upper end as shown with the center of curvature adjacent the filament 10^a which renders it more sensitive than the flat strip 12 in Figure 1. The free end of the thermal strip 12^a is provided with a contact piece 14^a the end of which will be submerged in the mercury 8 in the mercury cup 7^a in the bottom of the bulb when the filament is cold and when the filament is energized, the heat generated as it becomes incandescent causes the free end of the thermal strip 12^a to move outwardly and withdraw the contact 14^a from the mercury.

In Figures 1 and 2, the flashing mechanism is arranged for a lamp construction in which the axis of the lamp is mounted in a vertical position with the pool of mercury supported in a well aligned with the axis and extending below the bottom of the bulb. It may be desirable to provide a lamp for mounting with the axis of the lamp in a horizontal position, such as shown in Figure 3. In this type, the depending well 7^b is formed in the side of the bulb 15^b, the sealed end of which is received in a lamp base 16^b and the leading in wires 5^c and 6^c are connected to the lamp contacts 5^d and 6^d. In this form, the leading in wire 5^c is preferably arranged below the leading in wire 6^c and the end enters the mercury 8 in the well 7^b. One end of the filament 10^b is connected to the extremity of the leading in wire 6^c and the other end to the support 11^b supported and held intermediate the leading in wires by the glass bead 9^b. In this form, the strip of thermal metal 12^b is preferably fluted or corrugated as shown with its axis lying in a horizontal plane. One end is connected to the support 11^b by the bracket 13^b and the free end is provided with a contact 14^b. The thermal strip is so arranged that when the circuit is broken through the switch and the thermal strip is cold, the contact 14^b will be submerged in the pool of mercury 8 so that when the circuit is established, the filament 10^b will become incandescent and the heat therefrom will cause the thermal strip 12^b to deform and move the contact 14^b out of the mercury 8 and break the circuit therethrough.

At times it may be desirable to construct a combined lamp and filament mechanism whereby the axis of the lamp will be in a vertical plane with the sealed end of the bulb extending below the bulb proper, as shown in Figure 4. In such a construction, the sealed end of the bulb 15^c is mounted in the lamp base 16^c and the sealed end recessed as at 7^c to form a cup to contain the pool of mercury 8. The leading in wire 5^c extends through the sealed end of the bulb and through the pool of mercury 8 to adjacent the upper end of the bulb 15^c where it supports one end of a glass bead 9^c. The leading in wire 6^c passes through a glass tube 18 extending upwardly from the sealed end of the bulb to a point above the upper surface of the mercury 8, the wire 6^c extending therebeyond to support the glass bead 9^c, passing downwardly through the bead to provide a support and connection for one end of the filament 10^c. The filament 10^c is connected to this extremity of the leading in wire 6^c and at the other end to the support 11^c, the latter spaced apart from the wires 5^c and 6^c and depending from the glass bead 9^c. The bi-metallic strip 12^c is preferably of the same curved formation as shown in Figure 2 and is connected to the filament support 11^c by the bracket 13^c. The free end of the bi-metallic strip 12^c is provided with a contact 14^c and the parts are so arranged that when the circuit is broken through the lamp, the bi-metallic strip 12^c will normally hold

the contact 14c submerged in the mercury 8 and when the circuit is established through the switch, the filament 10c will become incandescent and the heat generated thereby will deform the thermal strip 12c to withdraw the contact 14c from the mercury to break the circuit. The filament will then be deenergized and upon cooling, the thermal strip 12c will again bring the contact 14c in engagement with the mercury 8.

Should the form shown in Figure 4 be desired operated from an elevated position from where it is desired that the lamp flashing be visible only from above the lower portion of the bulb 15c can be blackened or part of the bulb surface silvered to not only obscure the flashing from below, but to accentuate and concentrate the light flashes upwardly.

Figure 5 illustrates a commercial form of a warning or highway intersectional traffic signal 19, for supporting a reflector 20 upon a rotatable bracket 21, in which this combined lamp and flasher may be advantageously employed.

Figure 6 illustrates the application of another form of this invention, wherein the alternate flashing of two lamp filaments may be accomplished, such as is often used at railroad crossings.

In this form the combined lamp and flasher 2a takes the form of that shown in Figure 1, corresponding parts being identified by like reference numbers, with the addition thereto of another contact member. A third leading in wire 22 is sealed in the upper sealed end of the bulb 2a, extending therethrough into the bulb below and passing through the glass bead 9, where it terminates a short distance beyond to provide a support for a flexible wire electrode 23. The flexible wire 23 terminates in a contact 24 which when the lamp is not flashing assumes a position spaced but adjacent to the well of mercury 8. Intermediate its length the flexible wire 23 is formed to extend across the path of movement made by the thermal member 12 when heated and insulated from electrical contact therewith by a glass bead or other form of insulation 25. When the filament 10 becomes incandescent and the thermal member 12 heated, contact 14 is removed from the mercury 8 while the wire 23 is flexed to bring its contact 24 into the well so that as one circuit is broken another is made. As the thermal member 12 cools following the opening of the filament circuit through contact 14 and mercury 8 the contact 14 is restored into engagement with the mercury while the flexible wire 23 moves the contact 24 out of the mercury.

To provide for alternate lamp flashing the wire 5 is connected to one side of a battery or other source of electrical energy B in which circuit may be interposed a hand or automatic switch S, which can be used to determine the time when the lamps are to operate. The opposite side of the battery B is connected by a wire 26 to the lead in wire 6 of lamp 2a, thus completing a circuit to the filament 10 when the switch S is closed and the contact member 14 is immersed in the mercury 8. The other lamp to be flashed comprises a commercial form of lamp L having a filament 10d the respective ends of which are connected to external contact terminals 27 and 28. Terminal 27 is connected by a wire 29 to lead in wire 22 of lamp 2a while terminal 28 is connected by wire 30 to wire 26 leading to the battery B.

When the switch S is open no current flows to either lamp and the contacts 14 and 24 of lamp 2a will assume the positions shown. Upon closing switch S the circuit through the filament 10 of lamp 2a will be made but the circuit through the filament 10d of lamp L is open since contact 24 of lamp 2a is out of contact with the mercury 8. As the filament 10 becomes incandescent and heats the thermal member 12, contact 14 will be withdrawn from the mercury and contact 24 immersed therein. The circuit through the filament 10 will be broken, but the circuit to filament 10d of lamp L established as contact 24 engages mercury 8. The filament 10d then will become incandescent and remain so until the thermal member 12 of lamp 2a cools, whereupon contact 24 is withdrawn from the mercury to open the circuit to filament 10d and the contact 14 returned into engagement with the mercury to reestablish the circuit through filament 10. As long as the switch S remains closed there will occur alternate flashings of the filaments 10 and 10d with the filament 10 being incandescent during the heating of the thermal member 12 and the filament 10d being incandescent during the cooling period of member 12.

Figure 7 illustrates another form of this invention by means of which additional or emergency flashing lamps may be automatically placed in operation to replace those in which the filament has burned out so as to insure the constant operation of a signal throughout a desired period.

In this form the combined lamp and flashers, 2b and 2c are shown as again taking the form of Figure 1 in which like parts are given like reference numbers and to which has been added an additional bi-metallic thermal member for operating an additional contact. Referring to the lamps 2b and 2c a third lead in wire 31 is sealed into the neck of the lamp with the wires 5 and 6, terminating within the bulb after passing through the glass bead 9 a short distance above the filament 10. Secured to the inner free end of wire 31 is one end of a fluted or corrugated bi-metallic thermal member 32 arranged above and close to the filament 10. The free end of the thermal member 32 has secured thereto a wire 33 which terminates in a contact 34 engaging the mercury 8 when the thermal member 32 is cold.

The thermal member 32 is of such a form that when the filament 10 becomes incandescent the member 32 will respond to the heat from the filament at a faster rate than will the thermal member 12. Thus the contact 34 will be removed from engagement with the mercury before the thermal member 12 has been sufficiently heated to cause the removal of contact 14 from the mercury. With a greater degree of movement being imparted to the thermal member 32 than to the thermal member 12 when the filament is energized the opening and closing of the filament circuit by the thermal member 12, as long as the supply of electricity continues, will occur with the thermal member 32 maintaining contact 34 out of engagement with the mercury. Contact 34 can thus be utilized to control a circuit to an additional lamp which will be completed when the filament burns out or is otherwise damaged so as to break the filament circuit whereafter the thermal member 32 cools to establish engagement of the contact 34 with the mercury.

As shown in Figure 7 two lamps 2b and 2c of the same kind are shown in a circuit arrangement which includes a lamp 2d of the type illustrated in Figure 1. Lamp 2b is connected from

lead in wires 5 and 6 to wires 35 and 36, connected to a source of electricity, by wires 37 and 38, respectively, with lead in wire 31 connected by wire 39 to lead in wire 5 of lamp 2^c. Lamp 2^c has its lead in wire 6 connected to wire 36 by wire 40 and lead in wire 31 by wire 41 to terminal 6^c of lamp 2^d. Lamp 2^d has its other terminal 5^e connected by wire 42 to wire 36 from the source of electricity.

With electricity available a circuit will be established over wires 35 and 37 to lead in wire 5 to energize the filament 10 of lamp 2^b from whence it continues through lead in wire 6 to the other side of the supply line 36. At this time contact 34 is in engagement with the mercury 8 so that a circuit is also established from this point through the thermal member 32, lead in wire 31 and over wire 39 to lead in wire 5 of lamp 2^c which then energizes filament 10 of that lamp as well as completing still another circuit through the mercury and contact 34 and lead in wire 31 of lamp 2^c over wire 41 to lamp 2^d through which the last named circuit is completed over wire 42 to the electric supply wire 36 so that filament 10 of lamp 2^d also becomes energized. However the circuits to lamps 2^c and 2^d will remain closed for only a short period, for in that time the filament 10 of lamp 2^b will heat the thermal member 32, therein causing the contact 34 connected thereto to be moved out of engagement with the mercury 8, thus opening the circuit to lamps 2^c and 2^d. As previously described, the operation of the thermal member 32 will remove the contact 34 from engagement with the mercury in much less time than the thermal member 12 will respond to the heat from the filament 10 to remove its contact from engagement with the mercury. With the lamp 2^b remaining in circuit with the source of electricity the filament 10 therein will intermittently flash as the thermal member 12 makes and breaks contact with the mercury upon heating and cooling. During this time the thermal member 32 maintains the contact 34 out of contact with the mercury so that the other lamps remain inoperative.

In the event the filament of lamp 2^b burns out the thermal member 32 will then cool to establish contact 34 into engagement with the mercury and the circuit will be completed therefrom over lead in wire 31 and wire 39 to lead in wire 5 of lamp 2^c whereupon it will operate in the same manner as lamp 2^b first operated so that lamp 2^c will continue to provide the lamp flashing through its filament 10 and shortly thereafter open the circuit over wire 41 to lamp 2^d by breaking contact of 34 with the mercury 8 in the same manner as accomplished in lamp 2^b.

Should the filament 10 of lamp 2^c burn out contact 34 therein will engage the mercury in the same manner as in lamp 2^b and the circuit to lamp 2^d will then be established and maintained over wire 41 so that it will then flash until the supply of electricity over the wires 35 and 36 is interrupted.

The arrangement of Figure 7 illustrates the use of two additional flashing lamps for emergency use in which the first two lamps in the arrangement are of the type disclosed in which an additional thermally actuated contact 34 is employed and operating, if the filament in the same lamp burns out, to establish a circuit to the next lamp and wherein the last lamp in the circuit arrangement is of the form illustrated in Figure 1. It is obvious that any number of additional lamps may be interposed in the circuit arrangement and that all may be of the same type as lamp 2^b or as shown in Figure 7 the last lamp 2^d may take the form of that shown in Figure 1.

What I claim is:

1. A combined incandescent lamp and flasher switch including the provision of means for retaining a pool of mercury, extending one of the leading in wires of the lamp to terminate with its end submerged in the pool of mercury, connecting the other leading in wire to one end of the lamp filament and interposing between the other end of the lamp filament and pool of mercury, a temperature responsive mechanism normally closing the circuit within the lamp bulb and upon the establishment of an electric circuit therethrough, the passage of the current through the filament increases the temperature thereof to actuate the said mechanism to open the circuit through the lamp bulb.

2. The structure of claim 1, wherein said mechanism includes a strip of bi-metallic metal connected at one end to the lamp filament and provided at the free end with a contact member adapted to engage and be submerged within the pool of mercury.

3. In a combined incandescent lamp and flasher switch, an incandescent lamp bulb having means formed in the bulb for retaining a pool of mercury, one of the leading in wires of the lamp having its free end submerged within the pool of mercury, an incandescent filament connected at one end to the other leading in wire, an insulated support for the other end of the filament, a strip of bi-metallic metal provided at one end with a contact member adapted to engage and disengage the pool of mercury, said strip being fixedly supported and connected in circuit with the filament support whereby heat generated by the passage of electric current through the filament will cause the bi-metallic strip to deform and withdraw its contact member from the pool of mercury to break the circuit within the bulb.

4. The structure of claim 3 wherein a third leading in wire is provided having a resilient member terminating in a contact point normally maintained in engagement with the pool of mercury and wherein said resilient member is of bi-metallic metal responsive to the heat of the incandescent filament to move its contact point out of engagement with the mercury before the first bi-metallic member deforms to withdraw its contact point from the pool of mercury whereby when the filament becomes inoperative said second bi-metallic member cools to move its contact into engagement with the mercury to complete a circuit in which it is interposed which circuit includes a plurality of similar combined incandescent lamp and flasher switches.

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