To all whom it may concern:

Be it known that I, William J. Phelps, a citizen of the United States, and a resident of Detroit, county of Wayne, and State of Michigan, have invented certain new and useful Improvements in Double-Circuit Flashers, of which the following is a specification.

The invention relates to flashing switches by which two circuits are automatically and alternately opened and closed and such as are usually employed for controlling the circuits of two sets of electric lamps or other advertising devices.

Ordinarily expensive motor driven switches of complicated construction are employed for alternately flashing two sets of lamps arranged in an advertising sign and the present invention seeks to provide a simple, inexpensive thermostatically controlled switch which may be employed for alternately opening and closing two circuits or the separate branches of a double circuit so that two sets of lamps of a sign may be alternately flashed or other advertising device, that necessitates two circuits, properly operated.

The invention also seeks to provide a switch of this sort which will operate with certainty.

The invention consists in the construction and arrangement of parts and circuits hereinafter set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a plan view of one form of the improved double circuit flasher. Fig. 2 is an end view thereof. Fig. 3 is a section on line 3-3 of Fig. 1. Fig. 4 is a diagram of the circuits employed with the switch shown in Figs. 1, 2 and 3. Fig. 5 is a plan view of the modified form of switch. Fig. 6 is a sectional view taken on line 6-6 of Fig. 5. Fig. 7 is a diagram of the circuits employed to form the switch shown in Figs. 5 and 6.

The parts are mounted upon a suitable base 10 of slate or like material. A thermostatic switch member 11, preferably in the form of a single strip of homogeneous metal or alloy that is readily expansible by heat, is fixed at its ends by binding screws 12 to the base 10. A metal conducting strip 13 fixed to the base 10 by a binding post 14 is bent over the central portion of the thermostatic switch member 11 and carries a central circuit screw 15 arranged above a central contact 16 on the switch member 11. Contact screw 15 is adjustable and is held in adjustable position by a lock nut 17. When the bow-shaped switch member 11 is heated it will increase in length and its central portion will be lifted to bring the contact screw 15 into engagement with the contact screw 16. When cooled the engagement of these contacts is broken. A heating coil 18 of fine high resistance wire is wound about but insulated from the thermostatic switch member 11 and by controlling the flow of current through the coil, the switch member may be alternately heated and cooled.

The form of thermostatic switch described is similar to that set forth in the application of Andrew H. Miller, Serial No. 316,180, filed May 10, 1906. Other forms of thermostatic switches could be employed if desired.

The thermostatic switch controls one of the circuits or branches and a second switch 19 is arranged to control the other circuit. This switch is in the form of a thin strip of brass and is mounted upon the armature 20 of an electro magnet 21. The armature is connected by a leaf-spring 22 of thin brass to an abutment 24 on the metal frame 25 of the magnet 21. The end of the leaf-spring 22 is bent outwardly away from the armature and engages a back stop or post 26 rising from the frame 25. An adjusting screw 27 is threaded through the projection 24 and engages the leaf-spring 22. A lock nut 28 holds the screw 27 in its adjusted position.

The end of the switch 19 is provided with a contact 29 arranged to engage a contact screw 30 which is adjustably threaded through the upright portion of a bent strip 31 of brass or like conducting metal. The brass strip 31 is held to the base 10 by a binding post 32 and the contact screw 30 is held in adjusted position by a lock nut 33.

As illustrated in the diagram in Fig. 4, one of the main supply wires 34 is connected to the binding post 12, which in turn is in electrical connection with the thermostatic switch member 11 and with the metal frame 25 of the magnet through the medium of a copper strip 35. The other main supply wire 36 forms a return for the two sets of lamps 37 and 38. One end of the coil of the magnet 21 is connected to its frame and to the copper conducting strip 35 by a conductor 39. A conductor 40 connects the other
end of the coil of the magnet to one end of the heating coil 18. The opposite end of the heating coil is connected by a conductor 41 to the binding post 14 and a conductor 42 leading from the binding post 14 leads to the set of lamps 37. A conductor 43 from the binding post 32 leads to the other set of lamps 38.

The position of the parts shown in the diagram in Fig. 4 is that assumed immediately after the current is turned on. The circuit may be traced from the supply wire 34, conductors 35 and 39 to the magnet 21, thence by conductor 40, heating coil 18 and conductor 41 to the binding post 14, thence by conductor 42 through the set of lamps 37 and back by the return supply wire 36. The resistance of the heating coil 18 however, which is thus in series with the lamps 37, is so proportioned that only a small amount of current will flow through this circuit and the lamps 37 will remain dark. The magnet 21 is however energized and switch 19 shifted to closed position as shown, so that the current may be traced through the other branch or circuit from the main supply wire 34 through conductor 35, magnet frame 25, switch 19 and by contacts 29 and 30 and conductor 43 through the set of lamps 38 to the return wire 36. Lamps 38 will thus be lighted while the lamps 37 are dark. The flow of current however, through the coil 18 will gradually heat up and expand the thermostatic switch member 11 and after a short interval of time, contact 16 on the switch member will be brought into engagement with the contact screw 15. The current will then flow from the supply wire 34 through the body of the switch member 11 and by contacts 16 and 15 and conductor 42 through the set of lamps 37 to the return wire 36. The thermostatic switch member 11 thus, when closed, cuts out or short circuits the heating coil 18 and magnet 21 and forms a low resistance shunt around the coil and magnet so that practically no current flows through them. Magnet 21 is thus deenergized and switch 19 opens to break the circuit through the set of lamps 38, and at the same time lamps 37 light up since the resistance coil 18 has been cut out of its circuit. The coil 18 and thermostatic switch member 11 then slowly cool until the engagement of contacts 16 and 15 is broken and the current then again flows through the magnet 21 and heating coil so that the set of lamps 37 become dark as described, and switch 19 is shifted to closed position to flash up the set of lamps 38. In this way the two sets of lamps 37 and 38 which may be arranged in any suitable manner in an electric sign or advertising devices, are automatically and alternately flashed on and out. Other electric display or advertising devices could be operated with the switch.

The details of construction may be varied, for example other forms of thermostatic switches could be employed and other electrical operating means for the switch of the second circuit or branch could be used.

In the modification shown in Figs. 5 to 7 inclusive, the thermostatic switch for controlling the circuit or branch through the set of lamps 37 is similar to that shown in Figs. 1 to 4 inclusive. The switch member 44 for controlling the other circuit is connected by a thin strip of spring metal 45 to a binding post 46 on a U-shaped metal support 47 fixed to the base 48. The free end of the switch 44 carries an adjustable contact screw 49 arranged to engage a contact 50 on a bent metal strip 51 secured to the base 48 by a binding post 52. A piece of fine resistance wire 53 extends beneath the switch 44 and is connected at one end to a screw 54 which extends loosely through the metal strip 47 and is provided with an adjusting nut 55. The other end of the 19 switch is connected by an insulating block 56 to a hook 57 on a spring-held plate 58. This plate is loosely mounted on two horizontal pins 59 carried on angle pieces 60 that are fixed to the base 48. Springs 61 coiled about the pins 59 extend between the angle pieces 50 and the plate 58. The plate 58 is connected by two fine wires 62 to the metal strip 47. The switch 44 is provided with a depending lug 63 of insulating material which normally rests upon the wire 53. The spring 45 of the switch 44 tends to depress its outer end and bring the contact 49 thereon into engagement with the contact 50. But the lug 63 on the switch rests upon the wire 53 and the tension of this wire is so adjusted as to normally hold the switch 44 in open position. The wire 53 is very fine and of high resistance so that the passage of current through the wire will quickly heat it so as to increase its length and thus permit the shift of the switch 44 to closed position. The wires 62, which are connected to the spring-held plate 58 are the same size and are of practically the same length as the wire 53 so that all three wires will be expanded and contracted equally by any change in the atmospheric temperature, and the spring-held plate 58 will move with them so that the wire 53 will be always held under the same tension in spite of any variation in the atmospheric temperature. But when wire 53 is heated by the passage of current therethrough, it alone will expand and as plate 58 is held against movement by the wire 62, the wire 53 will sag slightly so that switch 44 is quickly shifted by its spring 45 and by gravity to closed position. As shown in the diagram in Fig. 7, the set of lamps 37 are connected, as before, by conductor 42 to the contact 15 and the other set of lamps 38 are connected by a conductor 64 to the contact 50. The return supply wire 36 is con-
nected to both sets of lamps and the other supply wire 34 is connected to the thermostatic switch 11, switch 44 and resistance wire 53, which in turn is connected by a conductor 65 to the heating coil 18. In this form the arrangement of the circuits and the operation is similar to that previously described, the high resistance wire 53 taking the place of the magnet for operating the switch of the second circuit or branch.

When the current is turned on it may be traced from the supply wire 34 to the binding post 46, screw 54, resistance wire 53, conductor 65 through the heating coil 18, conductors 41 and 42 through the set of lamps 37 to the return supply wire 36. As before, the heating coil 18 in series with the set of lamps 37, so cuts down the current flowing that the lamps remain dark. The flow of current however will very quickly heat the resistance wire 53, which is of very small mass so that it is increased in length and permits the quick shift of the switch 44 to closed position so that the current of the set of lamps 38 is closed as follows: from supply wire 34 to switch 44, contacts 49 and 50, conductor 64 through the lamps 38 to the return supply wire 36. Coil 18 then slowly heats the switch member 11 until the contacts 16 and 15 are brought into engagement when the heating coil 18 and high resistance wire 53 are shunted or short circuited and little or practically no current flows therethrough. High resistance wire 53 will quickly cool and lift the switch 44 to open the circuit through the set of lamps 38, and the lamps 37 will light up since the resistance coil 18 has been short circuited. The thermostatic switch 11 will then cool and after a short interval of time contract sufficiently to break the engagement of the contacts 15 and 16 so that the set of lamps 37 will become dark as before, and the set of lamps 38 lighted up.

It will be noted that in the improved double circuit flasher, a thermostatic switch is provided for one circuit which is alternately shifted to its opened and closed positions by an electric resistance heater, and that an appreciable time elapses after the current is turned on or cut off from the heater before the switch is operated, due to the slow heating and cooling of the comparatively large mass forming in the thermostatic switch. The flow of current through the heater is controlled or modified by contacts which in turn are actuated by the thermostatic switch. In both forms the switch for the second circuit or branch is provided with operating means which acts quickly or as soon as the current is turned on thereto to shift the switch to closed position, and in each form the operating means for the second switch is controlled by the movement of the thermostatic switch 11.

The form shown in Figs. 5 and 6 is well adapted for either direct or alternating current, and by inserting a soft pad 66 of felt or like yielding material between the armature 20 and the poles of magnet 21 in the other form, it may be employed both with direct and alternating current. Preferably, the felt pad 66 is cemented to the face of the armature 20 and serves to dampen out the vibrations of the armature when alternating current is employed, so that the switch contacts 29 and 30 are held firmly in engagement when the magnet 21 is energized.

It is obvious that numerous changes may be made in the details of construction and arrangement of circuits set forth without departure from the essentials of the invention.

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

1. In double circuit flashers, the combination with two circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, a controlling switch for the second circuit, a resistance heater controlling said thermostatic switch, electric operating means for the second switch in circuit with said resistance heater and contacts and connections controlled by said thermostatic switch for short circuiting said heater and said operating means, substantially as described.

2. In double circuit flashers, the combination with two circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, a switch for controlling the flow of current through the second circuit, a resistance heater controlling said thermostatic switch and electric operating means for said second switch in circuit with said heater, said thermostatic switch in closed position forming a low resistance shunt around said heater and the operating means for said second switch, substantially as described.

3. In double circuit flashers for electric lamps, the combination with two circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, a controlling switch for the second circuit, a resistance heater for said thermostatic switch and electric operating means for the switch of the second circuit and contacts and connections controlled by the thermostatic switch for modifying the flow of current through said heater and said electric operating means, substantially as described.

4. In double circuit flashers for electric lamps, the combination with two circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, a controlling switch for the second circuit, a resistance heater for said thermostatic switch and electric operating means for the switch of the second circuit, said heater and said operating means for the second switch being
arranged in the circuit controlled by the thermostatic switch, whereby the flow of current therethrough will be modified by the operation of said thermostatic switch, substantially as described.

5. In double circuit flashers for electric lamps, the combination with two circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, a controlling switch for the second circuit, a resistance heater for said thermostatic switch and electric operating means for the switch of the second circuit, said heater and said electric operating means being connected in series with the set of lamps controlled by said thermostatic switch and said thermostatic switch forming, in closed position, a low resistance shunt around said heater and said electric operating means, substantially as described.

6. In double circuit flashers for electric lamps, the combination with two branch circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, an electric heater controlling the operation of said switch, a switch for the second circuit and an operating magnet therefor, said heater and said magnet being alternately thrown into and out of operation by the shift of said thermostatic switch, substantially as described.

7. In double circuit flashers, the combination with two branch circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, an electric resistance heater controlling the operation of said thermostatic switch, a switch for the second circuit, an operating magnet therefor and contacts and connections controlled by said thermostatic switch for modifying the flow of current through said heater and said magnet to alternately throw the same into and out of operation, substantially as described.

8. In double circuit flashers, the combination with two branch circuits and two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, an electric resistance heater controlling the operation of said thermostatic switch, a switch for the second circuit and an operating magnet therefor, said thermostatic switch, in closed position, forming a low resistance shunt around said heater and said magnet whereby said thermostatic switch is shifted back and forth to alternately throw said heater and said magnet into and out of operation, substantially as described.

9. In double circuit flashers for electric lamps, the combination with two circuits and with two sets of lamps, one set in each circuit, of a thermostatic switch for one circuit, an electric resistance heater controlling the operation of said switch, a switch for the second circuit, an operating magnet therefor and contacts and connections controlled by said thermostatic switch for modifying the flow of current through said heater and said magnet, substantially as described.

10. In double circuit flashers for electric lamps, the combination with two circuits and with two sets of lamps, one in each circuit, of a thermostatic switch for one circuit, an electric resistance heater controlling the operation of said switch, a switch for the second circuit, an operating magnet therefor, said heater and said magnet being arranged in series in the circuit controlled by said thermostatic switch and said switch being arranged to form a low resistance shunt around said heater and magnet but in closed position, substantially as described.

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Witnesses:

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