Feb. 16, 1937. H. HUBBELL, JR., ET AL 2,070,599

HEATER SWITCH

Filed Dec. 8, 1933 2 Sheets-Sheet 1

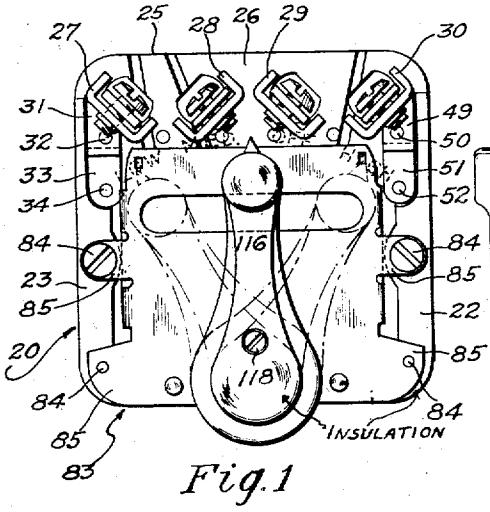


Fig. 1

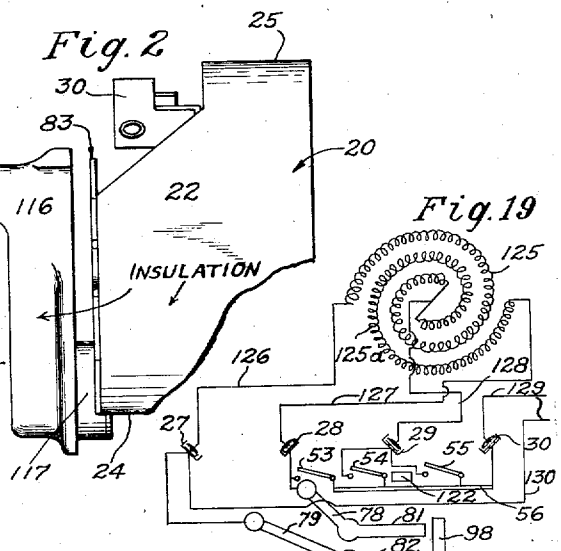


Fig. 2

Fig. 19

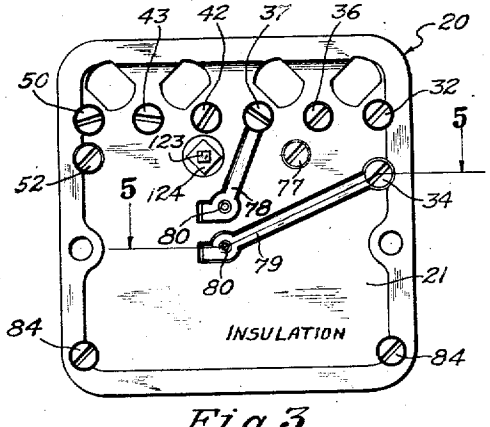


Fig. 3

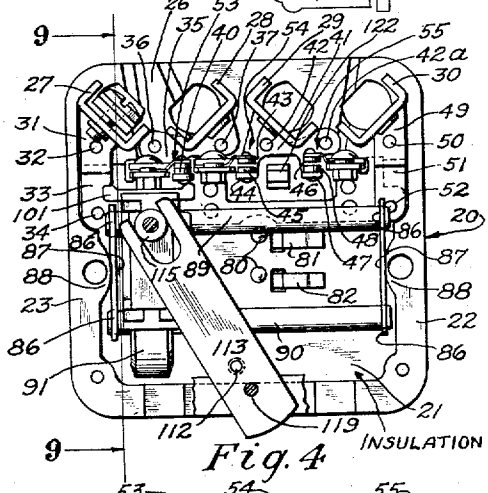


Fig. 4

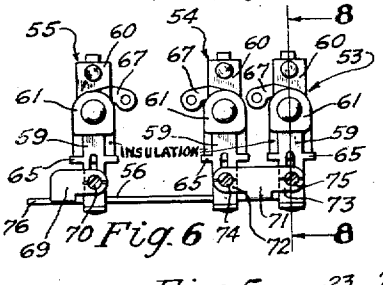


Fig. 6

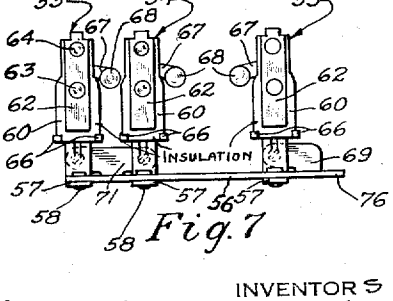


Fig. 7

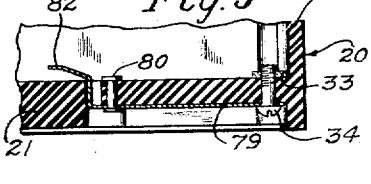


Fig. 5

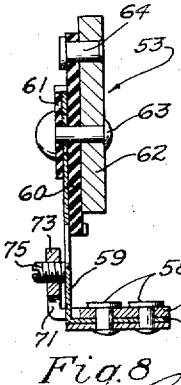


Fig. 8

INVENTORS

Harvey Hubbell Jr
and Charles E. Avery

ATTORNEYS

Wooster & Davis

Feb. 16, 1937. H. HUBBELL, JR., ET AL 2,070,599

HEATER SWITCH

Filed Dec. 8, 1933 2 Sheets-Sheet 2

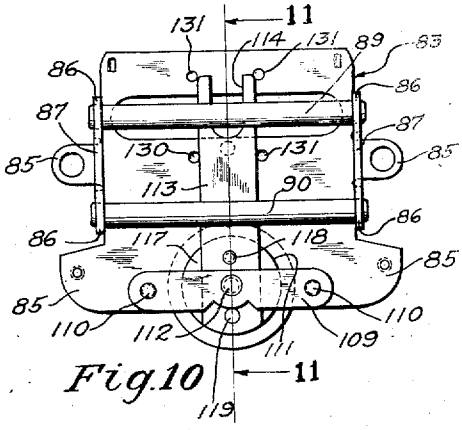


Fig. 10

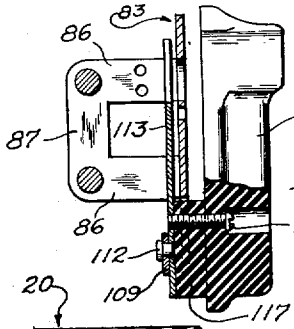


Fig. 11

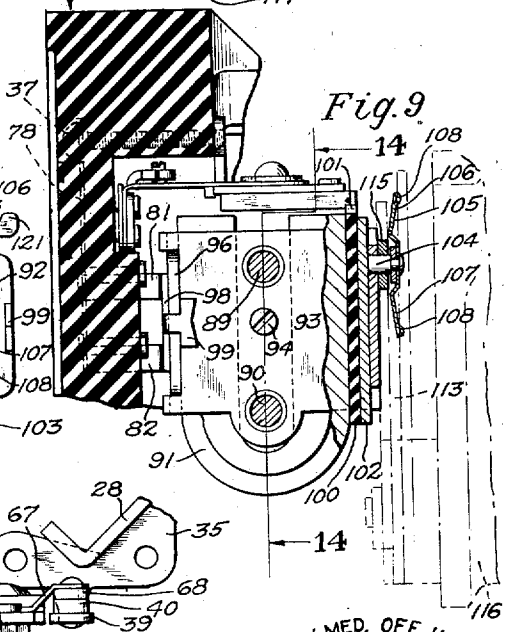


Fig. 9

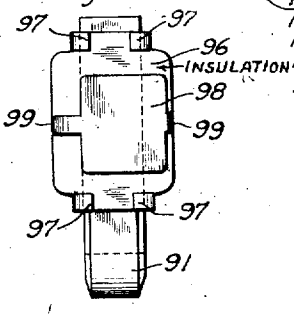


Fig. 12

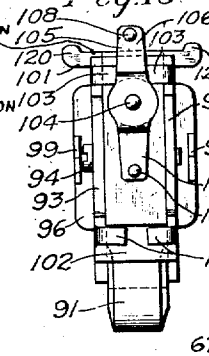


Fig. 13

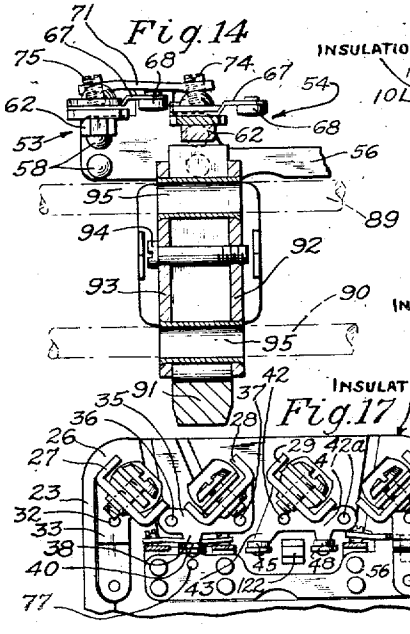


Fig. 14

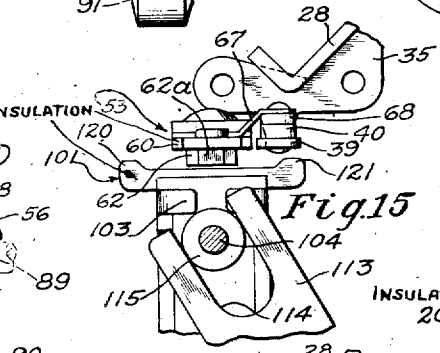


Fig. 15

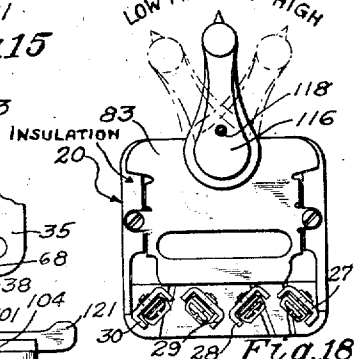


Fig. 18

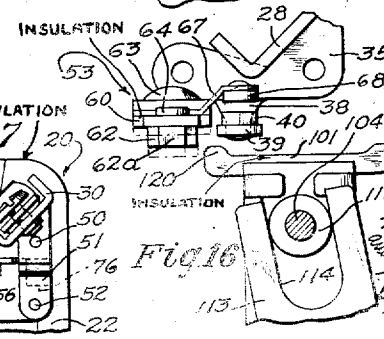


Fig. 16

Fig. 17

INVENTORS
Harvey Hubbell Jr.
and Charles E. Abery
By Wooster & Davis
ATTORNEYS

Patented Feb. 16, 1937

2,070,599

UNITED STATES PATENT OFFICE

2,070,599

HEATER SWITCH

Harvey Hubbell, Jr., and Charles E. Avery, Bridgeport, Conn., assignors to Harvey Hubbell, Incorporated, Bridgeport, Conn., a corporation of Connecticut

Application December 8, 1933, Serial No. 701,458

16 Claims. (Cl. 200—87)

This invention relates to new and useful improvements in electric switches and has particular relation to a heater switch.

An object of the invention is to provide a heater switch wherein the binding posts may be arranged in a straight row whereby the switch may be easily wired.

Another object is to provide a magnetic switch having a much easier action than the usual rotary switch.

An additional object is to provide a heater switch of generally improved construction including many features adapting it for installation and for easy and convenient operation.

In general the invention includes a switch including a pair of contacts, a slidably mounted magnet adapted to be positioned to cause said contacts to engage, and manually operable means for sliding said magnet.

It also comprises a switch including a plurality of pairs of switch elements of which each pair includes a stationary and a movable switch element, each of said movable switch elements including a piece of magnetic metal, and a slidably mounted magnet adapted to be positioned to attract a selected movable switch element to cause it to move into circuit closing position.

It further comprises a switch including a stationary and a movable contact, a magnet shiftable into operative relation to the movable contact to attract it and move it into circuit closing engagement with said stationary contact, said movable contact being associated with means whereby it is moved away from said stationary contact on movement of said magnet out of operative relation with the movable contact. The device also includes means movable with said magnet to engage said movable contact and force it out of engagement with the stationary contact if the contacts do not separate under action of said first mentioned means when the magnet is moved out of operative relation to said movable contact.

Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein a satisfactory embodiment of the invention is shown. However, it will be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawings:

Fig. 1 is a front elevational view showing a switch constructed according to the present invention;

Fig. 2 is a side elevational view thereof, a part being broken away;

Fig. 3 is a rear elevational view of the switch;

Fig. 4 is a view somewhat similar to Fig. 1, the top plate and operating handle being omitted whereby the inner structure is shown;

Fig. 5 is a detail sectional view taken substantially along the line 5—5 of Fig. 3;

Fig. 6 is a rear elevational view of the movable contact elements or armatures alone;

Fig. 7 is a front elevational view of the contacts of Fig. 6;

Fig. 8 is a sectional view taken substantially along the line 8—8 of Fig. 6;

Fig. 9 is an enlarged detail sectional view, the view being taken substantially along the line 9—9 of Fig. 4;

Fig. 10 is an elevational view of the inner side of the cover plate and the parts carried thereby, the magnet being omitted;

Fig. 11 is a sectional view taken substantially along the line 11—11 of Fig. 10;

Fig. 12 is a rear view of the magnet and a switch element carried thereby;

Fig. 13 is a front view of the magnet showing a feeler spring and a kick-off means carried thereby;

Fig. 14 is a detail sectional view taken substantially along the line 14—14 of Fig. 9;

Fig. 15 is an elevational view showing the relation between the magnet and a pair of contacts with the latter held in engagement by the magnet;

Fig. 16 is a view somewhat similar to Fig. 15 but with the magnet moved out of operative relation with the switch elements;

Fig. 17 is an elevational view showing the contacts at the upper end or front of the switch, parts being broken away, that other parts may be better illustrated;

Fig. 18 is an elevational view illustrating the manner in which the switch handle may be shifted for more convenient manipulation; and

Fig. 19 is a wiring diagram showing how this switch may be connected to control a multiple unit range heater.

Referring in detail to the drawings, the improved switch as here shown includes a hollow body of insulating material generally designated 20 open at its outer or front side and including an inner or rear wall 21 opposite said open side. The body also includes side walls 22 and 23, bottom wall 24 and a top wall 25. The wall 25 is cut away or does not extend out the same dis-

tance as do the side walls and the bottom wall and is relatively thick to provide a mounting surface or portion 26. On this surface 26 there are disposed four binding posts 27, 28, 29 and 30. Binding post 27 includes a base portion 31 clamped against or drawn against surface 26 as by means of a screw 32 passing through the thickened top wall 25 of the body from the underside thereof. This base 31 also includes the extension 33 into which is threaded a screw 34 and the purpose of this extension and screw will later be more fully set forth.

Binding post 28 includes a base 35 through the end portions of which extends screws 36 and 37 the said screws being threaded into said base 35 of the binding post and drawing the base against the surface 26. Screw 37 has an added function as will later appear. Intermediate its end portions binding post base 35 carries an extension 38 (Figs. 16 and 17) which extends forwardly from said base and is then turned upwardly providing an arm 39 carrying a contact 40. (See Figs. 15 and 16.) Binding post 29 includes a base portion 41 (Figs. 4 and 17) into which are threaded screws 42 and 42a passing through the rear wall 21 of the body and this base 41 includes an extension 43 carrying a forwardly extending arm 44 on which is mounted a contact 45. In spaced relation to this structure base 41 carries an extension 46 the outer end portion of which is bent to provide a forwardly extending arm 47 and the latter carries a contact 48. Binding post 30 is of substantially the same construction as binding post 27 and includes a base portion 49 secured in place as by a screw 50 and the said base includes an extension 51 the purpose of which will later be set forth and through said extension is threaded a screw 52.

A movable switch element is associated with each of the binding post contacts 40, 45 and 48 and these switch elements are designated 53, 54 and 55 respectively. These switch elements are all connected to a bus bar 56 and each switch element includes a laterally extending portion 57 secured to the bus bar as by rivets or the like 58 and each switch element further includes an upwardly or outwardly extending spring arm 59 against the forward face of which at a point above the bus bar there is disposed a block of insulating material 60 and against the rear face of the upper portion of said arm there may be disposed an insulator 61. Disposed against the forward face of insulator 60 is an armature or magnetic piece 62 and a rivet 63 passes through said armature, the insulators 60 and 61 and the arm 59 while a second rivet 64 may secure the armature or magnetic piece 62 to an upwardly extending portion of the insulator 60. Further, the arm 59 may include extensions 65 having their end portions 66 bent about the lower portion of the insulator 60.

Each arm 59 includes laterally extending portion 67 and each of said portions carries a contact 68 and it will be noted particularly by reference to Figs. 15 and 16 that said extensions 67 are offset rearwardly with respect to the arm and provide spring mountings for the contact 68. Further, it will be apparent that the arms 59 may be of resilient or spring metal and may be flexed, and it is through flexing of these arms that the respective contacts 68 are moved into engagement with the binding post contacts 40, 45 and 48. The resiliency of the arms tends to move the contacts 68 away from the stationary contacts and carry the insulator 61 against the base of its associated binding post, which serves as a back stop. Means are provided for adjusting the tension of spring arms 59, and to this end bus bar 56 is provided with an upturned extension 69 disposed at the outer side of the spring arm 59 of switch element 55 and said extension 69 carries a screw 70 adjustable through the extension and at its inner end bearing against the spring arm of switch element 55. A second extension 71 carried by the bus bar includes laterally extending arms 72 and 73 through which are threaded screws 74 and 75 and it will be apparent from Fig. 6 that on adjustment of the screw 74 the spring arm of switch element 54 may be adjusted to proper tension, while on adjustment of the screw 75 the spring arm of switch element 53 will be adjusted.

Bus bar 56 includes an extension 76 and the extension 51 of the base of the binding post 30 is connected to said bus bar extension 76 by the screw 52 previously referred to. This screw passes through the bus bar extension and the extension of the base of the binding post 30 and serves to draw said parts into engagement whereby to provide a good electrical connection. Since the switch elements are all secured to the bus bar the latter provides a convenient means for mounting the switch elements in the body and to this end the bus bar is disposed against the inner surface of the rear wall 21 of the body immediately inwardly of the thickened wall 25 and is secured in place by the screw 52 above referred to and by a second screw 77 also extending through the wall 21 of the body. In connection with these various screws passing through the rear wall 21 of the body it will be understood that all such screws preferably have their heads disposed in recesses which may be filled with sealing wax whereby there is little danger of short circuiting between them.

Arranged in spaced grooves in the outer surface of the wall 21 are a pair of strap-like conductors 78 and 79 (Fig. 3) and it will be noted that the strap member 78 includes a portion secured under the head of the screw 37 and the strap member 79 includes a portion disposed under the head of the screw 34. Therefore, strap member 78 is electrically connected with the binding post 28 while strap member 79 is electrically connected with the binding post 27. Each strap member is additionally secured in place as by a rivet 80 passing through wall 21 and strap member 78 includes the portion 81 passed forwardly through an opening in the rear wall 21 of the body while strap member 79 includes a portion 82 passed forwardly through a similar opening in said wall of the body. These portions 81 and 82 are preferably somewhat bowed and they extend above the inner surface of the wall 21 of the body and provide spring contacts for closing a shunt circuit between the binding posts 27 and 28 in a manner and for a purpose later to be described.

Disposed across the open side of the body 20 is a plate or closure 83 which may be of metal or other material as desired, and this plate may include suitable lateral extensions 85 through which are passed securing screws 84 passing through the body to attach the plate thereto. Also, the plate includes rearwardly extending side arms 86 two of said arms being carried by each edge portion of the plate or closure 83 and these arms extend into the hollow body 20, and the arms at the respective edges are connected by integral portions 87. A pair of spaced rods 89 and 90 are arranged within the body, and the arms are sup-

ported in parallel relation and have their end portions disposed in openings in the inner end portions of the arms 86. These rods 89 and 90 need not be secured to the arms but are held in position by the inner surfaces of the side walls 22 and 23, which surfaces the end of the bars may engage at the respective sides of the enlargements 88.

Mounted to slide on the rods 89 and 90 is a magnet 91 here shown as a horseshoe magnet, and this magnet is clamped between a pair of brass plates 92 and 93, (Figs. 13 and 14) which plates are secured together as by a screw 94. These plates also carry tubular bushings 95 through which the rods 89 and 90 extend and provide bearings on the rods. Such bushings are preferably of brass or other non-magnetic metal. Bushings 95 have a sliding fit on the rods 89 and 90 whereby the magnet may be slid along said rods to any desired position. Also, as these rods are located below the switch elements 53, 54 and 55 the magnet may be slid along the rods into an operative position with relation to any selected switch element.

Disposed against the inner arm of the magnet 91 is a piece of insulating material 96, the said material being held in place as by lugs 97 (Fig. 12) which latter are extensions of the plates 92 and 93. Disposed against the rear side of the insulation 96 is a contact bridging piece 98 held in place as by having extensions 99 turned over the edge portions of the insulator 96. The purpose of this bridging piece 98 will later be fully set forth.

On the forward arm of the magnet there is arranged a piece of insulating material 100 (Fig. 9) at its forward end including a head or kick-off 101. (Figs. 4, 9, 13 and 15.) Over this piece 100 is a piece of brass or other non-magnetic material 102 held in place as by clamping fingers 103 (Fig. 13) comprising extensions of the plates or walls 92 and 93. Extending forwardly from the inner of these plates is a post 104 carrying a feeler spring 105 arranged to extend in the direction of the magnet and transversely of the kick-off head 101 whereby the spring includes end portions 106 and 107 each having an outwardly pressed nub or tit 108. This feeler spring is secured against movement relative to the magnet as is also the kick-off 101.

At its rearward side adjacent one of its edges the closure plate 83 has secured to it a strap 109 (Figs. 10 and 11) the strap being secured in place as by rivets or the like 110, and this strap spans a cut-away portion 111 of the plate. Secured at one end to an intermediate portion of the strap 109 as by a rivet, pin or the like 112 is a bar or arm 113 and this bar extends upwardly to the rear of plate 83 and at its free end is slotted or kurfed as at 114 to receive a roller 115 on the pin or post 104. It will be apparent that owing to the pin and slot connection between the bar and the magnet swinging movement of the bar will result in a sliding movement of the magnet along the rods 89 and 90.

Disposed at the other side of plate 83 is a handle 116, and this handle includes a portion 117 (Fig. 11) passing through the above mentioned cut-away portion of plate 83 and connected on the pivoted end portion of bar 13. This portion 117 of the handle is slotted in its rear side to receive the bar 113, and a screw or other fastening means 118 is passed through the handle and threaded into an opening in the bar in eccentric relation to the pivot 12 so that the pin will serve to connect the bar and handle in such manner that turning movement of the handle will result in movement of the bar and a sliding movement of the magnet on the rods 89 and 90.

As shown in the first figures of the drawings, the binding posts are all arranged in a row adjacent one edge of the body of the switch. This layout provides for the easy installation of a switch on a stove or the like in that it is much easier to wire the same when the binding posts are arranged in a row adjacent one edge of the switch body. In the rotary type of switches the binding posts are located around the periphery of the switch and in some cases are quite inaccessible because of being close to a side wall of the stove or the like. In the present instance the binding posts may be located either at the upper or lower edge of the body since the body may be mounted either side up as is most convenient.

In order that the handle 116 may be properly located should the switch be mounted with the binding posts at its lower edge the position of said handle 116 may be reversed. This is accomplished by loosening the screw 118 and then raising the handle off the switch, turning the handle about to have it extend in the opposite direction and then disposing the handle with its portion 117 straddling the bar 113. Screw 118 is then again tightened, this time being threaded into an opening 119 in the rear end portion of the bar 113. In this modified position the switch handle will be disposed as shown in Fig. 18 of the drawings.

In the operation of the device the handle 116 is shifted to slide the magnet to dispose the latter in operative relation with any selected one of the movable switch elements 53, 54 and 55. As the magnet is disposed opposite one of these elements it attracts the magnetic piece or armature 62 of said element and draws the element inwardly flexing the spring arm 59. This will result in the contact 68 of the chosen switch element engaging the associated contact (either 40, 45 or 48) of one of the binding posts. As soon as the magnet is shifted out of operative relation with any particular switch element the spring arm of the element serves to return it to normal position or in circuit opening position. Should the contacts freeze together, then the kick-off 101 will function to positively force the movable switch element away from the stationary switch element or the switch element of which a binding post forms a part.

For example, should the contact 68 of switch element 53 freeze on the contact 40 of binding post 28 the kick-off 101 will serve to separate said contacts when the magnet is moved out of operative relation with them. Referring to Figs. 15 and 16, it will be noted that in Fig. 15 the magnet is in operative relation with the switch element 53 and that contact 68 is engaging contact 40. Now, when the magnet is moved out of operative relation with switch element 53, as to the position shown in Fig. 16, the contacts should separate owing to the action of spring arm 59. However, should they not separate then the enlargement or cam 120 of the kick-off 101 will engage the projecting end 62a the magnetizable piece 62 of switch element 53 and force it upwardly resulting in positive separation of contacts 68 and 40. Should it be that one of the other switch elements fails to move to open position when released then the opposite enlargement or cam 121 of the kick-off may function. That is, one or the other of the enlargements 120 and 121 will

always function to release a pair of contacts which have frozen together.

When the magnet is in inoperative position, that is when the switch is "off", the said magnet is disposed opposite a keeper 122 comprising a bar of iron or steel secured in place as by having a shank 123 pass through the bottom wall 21 of the body and secured as by a nut 124. The magnet need not be in actual engagement with this keeper but may be disposed in relatively close relationship to it, whereby the magnetic circuit will be closed and the magnet retains its magnetism.

In Fig. 19 the circuit is shown, and in this figure a multiple heater element is indicated comprising two coils or elements 125 and 125*a*, and it will be noted that by a lead 126 binding post 27 is connected with one end of said element 125 and that by a lead 127 binding post 28 is secured to or connected with the outer end of the element 125*a*. Further, by a lead 128 binding post 29 is connected with the center or inner ends of the heater elements. The power line comprises wires 129 and 130 the former of which is connected with binding post 30 while the latter is connected with binding post 27. As will also be seen from this figure element 78 is connected to binding post 28 while element 79 is connected to binding post 27.

From this it will be seen that when the magnet is moved into operative relation with switch element 53 current will be passed through both heater elements 125 and 125*a* entering by the line 127 from bus bar 56 and switch 53 and leaving by the line 126. The heater elements will be in series and since they offer high resistance will develop but a relatively low degree of heat. When the magnet is moved into operative relation with switch element 54, a medium degree of heat will be obtained since current will be supplied to the center of the heating element through wire 128 and the other side of the circuit is represented by wire 126, the wire 127 being dead since switch element 53 is open. In this position element 125 only is heated and to its full heat giving a medium heat for the multiple element. On the magnet being shifted to attract switch element 55 the bridging piece 98 on the back of the magnet (Figs. 9 and 12) is moved into position spanning the contacts 81 and 82 so that a shunt circuit is established between the binding posts 27 and 28. Also, switch element 55 having been moved to circuit closing position current will be supplied to the inner ends of both heater elements through the wire 128 and the heater elements will then be connected in parallel. With this last arrangement both elements are heated to maximum temperature and full heat will be developed. The circuit for heater element 125 is represented by bus bar 56, switch element 55, binding post 29, wire 128, and wire 126, to binding post 27. The circuit for the other element 125*a* is represented by the bus bar, switch element 55, wire 128, wire 127, conductor strip 78, bridging piece 98, and conducting strip 79 to the binding post 27.

The present heater switch has a much easier action than the rotary switch commonly used. Handle 116 is very easily turned and its full range of movement in a series parallel three-heat switch arrangement is only 60° of an arc. As pointed out above, the switch is not difficult to wire and the handle or hand piece 116 may have its position reversed so that it will be properly located for operation irrespective of whether the binding posts are located at the upper or lower edge of the switch body. The invention is not limited to the use of a pivoted handle for sliding the magnet since a simple slidable handle moving with the magnet may be employed.

When the magnet reaches its various positions, the small bulges or tits 108 of the feeler spring snap into depressions or recesses 131 formed in the under side of the closure or cover plate 83. Therefore, the frictional resistance of these bulges on the rear surface of plate 83 to movement of the handle is suddenly increased as the magnet reaches an operative position with relation to the switch element controlling the medium heating circuit and as the magnet comes opposite its keeper 122. The operative position of the magnet with relation to the other switch elements is represented by the limit of movement of the magnet toward the opposite side of the body. The bridging plate or piece 98 is so located that it completes the shunt circuit just prior to the closing of the circuit by the switch element 55 and such shunt circuit remains closed until the switch element 55 is released.

Having thus set forth the nature of our invention, what we claim is:

1. In a switch, a body of insulating material, a pair of normally spaced switch elements mounted on said body, a magnet in said body, guides within said body and mounting the magnet for bodily sliding movement between an operative and an inoperative position relative to said switch elements, a hand piece at the outer side of said body, means connecting the hand piece and magnet whereby the hand piece is operable to slide the magnet on said guides, and said magnet when in operative position relative to said switch elements adapted to cause them to engage.

2. In a switch, a body, a stationary switch element in the body, a movable switch element in the body and normally spaced from said stationary switch element, a horse shoe magnet in the body, a pair of non-magnetic plates clamped against the sides of said magnet and spanning the space between the arms thereof, a pair of spaced rods in said body and passing through said plates between the arms of the magnet and slidably mounting the magnet on the body, said magnet slidable on said rods between an operative and an inoperative position relative to said switch elements, means for sliding the magnet, an armature connected to the movable switch element, and said magnet when in operative position relative to said switch elements adapted to attract the armature to shift the movable switch element to cause it to make contact with the stationary switch element.

3. In a switch, a body, a stationary switch element, a movable switch element normally spaced from said stationary switch element, said movable switch element including a spring means whereby it automatically returns to normal position on being released after having been moved from normal position, a magnet in said body, a guide within said body and mounting the magnet for bodily sliding movement between an operative and an inoperative position relative to said switch elements, a hand piece at the outer side of the body, means connecting the hand piece and magnet whereby the hand piece is operable to slide the magnet on said guide, and said magnet when in operative position relative to said switch elements adapted to attract the movable switch element to cause it to move and make contact with the stationary switch element.

4. In a switch, a hollow body, a pair of normally spaced switch elements mounted in said body and of which one is movable into engagement with the other to close a circuit, a rod within and extending across said body transversely of said switch elements, a magnet within said body and slidable along said rod between an operative and an inoperative position relative to said switch elements, a hand piece at the outer side of said body and connected with the magnet to slide the same along said rod, and said magnet when in operative position adapted to attract said movable switch element to bring the switch elements into circuit closing engagement.

5. In a switch, a hollow body having an open side, a pair of normally spaced switch elements mounted in said body and of which one is movable into engagement with the other to close a circuit, a closure on the open side of said body, a pair of spaced parallel rods carried by said closure and arranged within said body, a magnet slidable on said rods between an operative position and an inoperative position relative to said switch elements, means at the outer side of said body and connected with the magnet for sliding the same, and said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement.

6. In a switch, a hollow body having an open side, a pair of normally spaced switch elements mounted in said body and of which one is movable into engagement with the other to close a circuit, a closure on the open side of said body, a rod carried by said closure and arranged within said body, a magnet slidable on said rod between an operative position and an inoperative position relative to said switch elements, a handle at the outer side of said body, means pivotally mounting the handle, means connecting the handle and magnet for sliding movement of the latter along said rod on pivotal movement of the handle, and said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement.

7. In a switch, a hollow body having an open side, a pair of normally spaced switch elements mounted in said body and of which one is movable into engagement with the other to close a circuit, a closure on the open side of said body, a rod carried by said closure and arranged within said body, a magnet slidable on said rod between an operative position and an inoperative position relative to said switch elements, a hand piece at the outer side of said closure, means pivotally mounting said hand piece, a bar within said body and connected to move with said hand piece, a pin and slot connection between the magnet and said bar whereby as said hand piece is given a pivotal movement the magnet is shifted along said rod, and said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement.

8. In an electric switch, a body, a pair of normally spaced switch elements of which one is movable toward and from the other to close and open a circuit, said switch elements mounted by said body, a magnet shiftable between an operative and an inoperative position in the former of which it attracts the movable switch element to cause it to move to circuit closing position, and a feeler means to indicate when said magnet is in operative position, said feeler means functioning by increasing the frictional resistance to further movement of the magnet.

9. In an electric switch, a body, a pair of normally spaced switch elements of which one is movable toward and from the other to close and open a circuit, said switch elements mounted by said body, a magnet shiftable between an operative and an inoperative position in the former of which it attracts the movable switch element to cause it to move to circuit closing position, a closure on said body, an operating handle located at the outer side of said closure and connected with said magnet to shift the same, said closure having a recess therein, a feeler spring movable in accordance with movement of the magnet, and said spring adapted to snap into said recess when said magnet is moved to operative position.

10. In a switch, a hollow body having an open side, a pair of normally spaced switch elements mounted in said body and of which one is movable into engagement with the other to close a circuit, a removable closure on the open side of said body, a rod carried by said closure and arranged within said body, a magnet slidable on said rod between an operative position and an inoperative position relative to said switch elements, a pivotally mounted hand piece disposed at the outer side of said closure, a bar within said body and connected to move with said hand piece, a connection between the magnet and said bar whereby as said hand piece is given a pivotal movement the magnet is slid along said bar, said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement, said closure having a recess therein, a feeler spring on the pin of said pin and slot connection and movable in accordance with movement of said magnet, and said spring adapted to snap into said recess when said magnet is moved to operative position.

11. In a switch, a body, a stationary switch element in said body, a movable switch element in the body and normally spaced from said stationary switch element and including spring means whereby it automatically returns to normal position on being released after having been moved from normal position, a magnet, means mounting the magnet for movement in the body between operative and inoperative positions relative to said switch elements, means for shifting said magnet, said magnet when in operative position adapted to attract the movable switch element to cause it to move to make contact with the stationary switch element, a kick-off means movable in accordance with movement of the magnet, and said kick-off means including a cam portion to engage said movable switch element and force it away from the stationary switch element should the movable switch element fail to move to open the circuit on movement of the magnet out of operative position.

12. In a switch, a body, a stationary switch element in said body, a movable switch element in said body and normally spaced from said stationary switch element and including spring means whereby it automatically returns to normal position on being released after having been moved from normal position, a magnet, means mounting the magnet for sliding movement in the body between operative and inoperative positions relative to said switch elements, means for sliding said magnet, said magnet when in operative position adapted to attract the movable switch element to cause it to move to make contact with the station-

ary switch element, a kick-off means movable in accordance with movement of the magnet, and said kick-off means including a cam portion to engage said movable switch element and force it away from the stationary switch element should the movable switch element fail to move to open the circuit on movement of the magnet out of operative position.

13. In a switch, a body, a stationary switch element on said body, a movable switch element on said body and normally spaced from said stationary switch element and including spring means whereby it automatically returns to normal position on being released after having been moved from normal position, a magnet, means mounting the magnet for movement in the body between operative and inoperative positions relative to said switch elements, means for shifting said magnet, said magnet when in operative position adapted to attract the movable switch element and move it into contact with the stationary switch element, said spring means for returning said movable switch element to normal position comprising a spring arm forming part of said switch element, and means engaging said arm and adjustable to change the normal tension thereof.

14. In a switch, a hollow body having an open side, a pair of normally spaced switch elements in said body and of which one is movable into engagement with the other to close a circuit, a closure on the open side of said body, two pairs of arms carried by said closure and extending into said body, parallel rods carried one by each of said pair of arms, a pair of connecting portions each connecting an arm of one of said pair of arms with an arm of said other pairs whereby to brace said arms, a magnet slidable on said rods between operative and inoperative positions relative to said switch elements, means to slide said magnet on said rods, and said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement.

15. In a switch, a body, a series of binding posts arranged in a substantially straight row along one edge of said body, a contact carried by each of said binding posts, a series of movable switch elements arranged in substantially a straight row and associated one with each of said binding posts, means whereby said switch elements are normally spaced from the contacts of the binding posts and are returned to normal position on being released after having been moved, a magnet, means slidably mounting the magnet in said body for translating movement along said row of switch elements, said magnet selectively slidable into operative relation with each of said switch elements, said magnet when in operative relation with a switch element adapted to move the same to bring it into engagement with the contact of its associated binding post, a handle connected with said magnet for sliding it, means pivotally mounting the handle whereby it extends toward the edge of the body along which said binding posts are arranged, means connecting the handle with the magnet to slide the latter as the handle is moved on its pivot, and said last means including means whereby the position of the handle may be reversed to have it extend toward the opposite edge of the body.

16. In a switch, a hollow body having an open side, a pair of normally spaced switch elements in said body and of which one is movable into engagement with the other to close a circuit, a closure on the open side of said body, a rod carried by said closure and arranged within said body, a magnet slidable on said rod between an operative position and an inoperative position relative to said switch elements, a pivotally mounted hand piece disposed at the outer side of said closure, a bar within said body and connected to move with said hand piece, a connection between the magnet and said bar whereby as the hand piece is given a pivotal movement the magnet is shifted along said rod, said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement, said handle extending toward one edge of the body and having a portion straddling said bar, means securing the handle and bar together in such relation, and said means adapted to be released to permit the handle to be shifted to extend toward the other edge of the body and then be again secured in position with its said portion straddling the bar.

HARVEY HUBBELL, JR.
CHARLES E. AVERY.

CERTIFICATE OF CORRECTION.

Patent No. 2,070,599. February 16, 1937.

HARVEY HUBBELL, JR., ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 66, for the word "other" read outer, and line 70, for "bar 13" read bar 113; page 4, second column, line 65, claim 3, strike out the period at the end of the line; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of June, A. D. 1937.

Henry Van Arsdale
Acting Commissioner of Patents.

(Seal)

ary switch element, a kick-off means movable in accordance with movement of the magnet, and said kick-off means including a cam portion to engage said movable switch element and force it away from the stationary switch element should the movable switch element fail to move to open the circuit on movement of the magnet out of operative position.

13. In a switch, a body, a stationary switch element on said body, a movable switch element on said body and normally spaced from said stationary switch element and including spring means whereby it automatically returns to normal position on being released after having been moved from normal position, a magnet, means mounting the magnet for movement in the body between operative and inoperative positions relative to said switch elements, means for shifting said magnet, said magnet when in operative position adapted to attract the movable switch element and move it into contact with the stationary switch element, said spring means for returning said movable switch element to normal position comprising a spring arm forming part of said switch element, and means engaging said arm and adjustable to change the normal tension thereof.

14. In a switch, a hollow body having an open side, a pair of normally spaced switch elements in said body and of which one is movable into engagement with the other to close a circuit, a closure on the open side of said body, two pairs of arms carried by said closure and extending into said body, parallel rods carried one by each of said pair of arms, a pair of connecting portions each connecting an arm of one of said pair of arms with an arm of said other pairs whereby to brace said arms, a magnet slidable on said rods between operative and inoperative positions relative to said switch elements, means to slide said magnet on said rods, and said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement.

15. In a switch, a body, a series of binding posts arranged in a substantially straight row along one edge of said body, a contact carried by each of said binding posts, a series of movable switch elements arranged in substantially a straight row and associated one with each of said binding posts, means whereby said switch elements are normally spaced from the contacts of the binding posts and are returned to normal position on being released after having been moved, a magnet, means slidably mounting the magnet in said body for translating movement along said row of switch elements, said magnet selectively slidable into operative relation with each of said switch elements, said magnet when in operative relation with a switch element adapted to move the same to bring it into engagement with the contact of its associated binding post, a handle connected with said magnet for sliding it, means pivotally mounting the handle whereby it extends toward the edge of the body along which said binding posts are arranged, means connecting the handle with the magnet to slide the latter as the handle is moved on its pivot, and said last means including means whereby the position of the handle may be reversed to have it extend toward the opposite edge of the body.

16. In a switch, a hollow body having an open side, a pair of normally spaced switch elements in said body and of which one is movable into engagement with the other to close a circuit, a closure on the open side of said body, a rod carried by said closure and arranged within said body, a magnet slidable on said rod between an operative position and an inoperative position relative to said switch elements, a pivotally mounted hand piece disposed at the outer side of said closure, a bar within said body and connected to move with said hand piece, a connection between the magnet and said bar whereby as the hand piece is given a pivotal movement the magnet is shifted along said rod, said magnet when in operative position adapted to attract one of said switch elements to bring the switch elements into circuit closing engagement, said handle extending toward one edge of the body and having a portion straddling said bar, means securing the handle and bar together in such relation, and said means adapted to be released to permit the handle to be shifted to extend toward the other edge of the body and then be again secured in position with its said portion straddling the bar.

HARVEY HUBBELL, JR.
CHARLES E. AVERY.

CERTIFICATE OF CORRECTION.

Patent No. 2,070,599. February 16, 1937.

HARVEY HUBBELL, JR., ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 66, for the word "other" read outer, and line 70, for "bar 13" read bar 113; page 4, second column, line 65, claim 3, strike out the period at the end of the line; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of June, A. D. 1937.

Henry Van Arsdale
Acting Commissioner of Patents.

(Seal)