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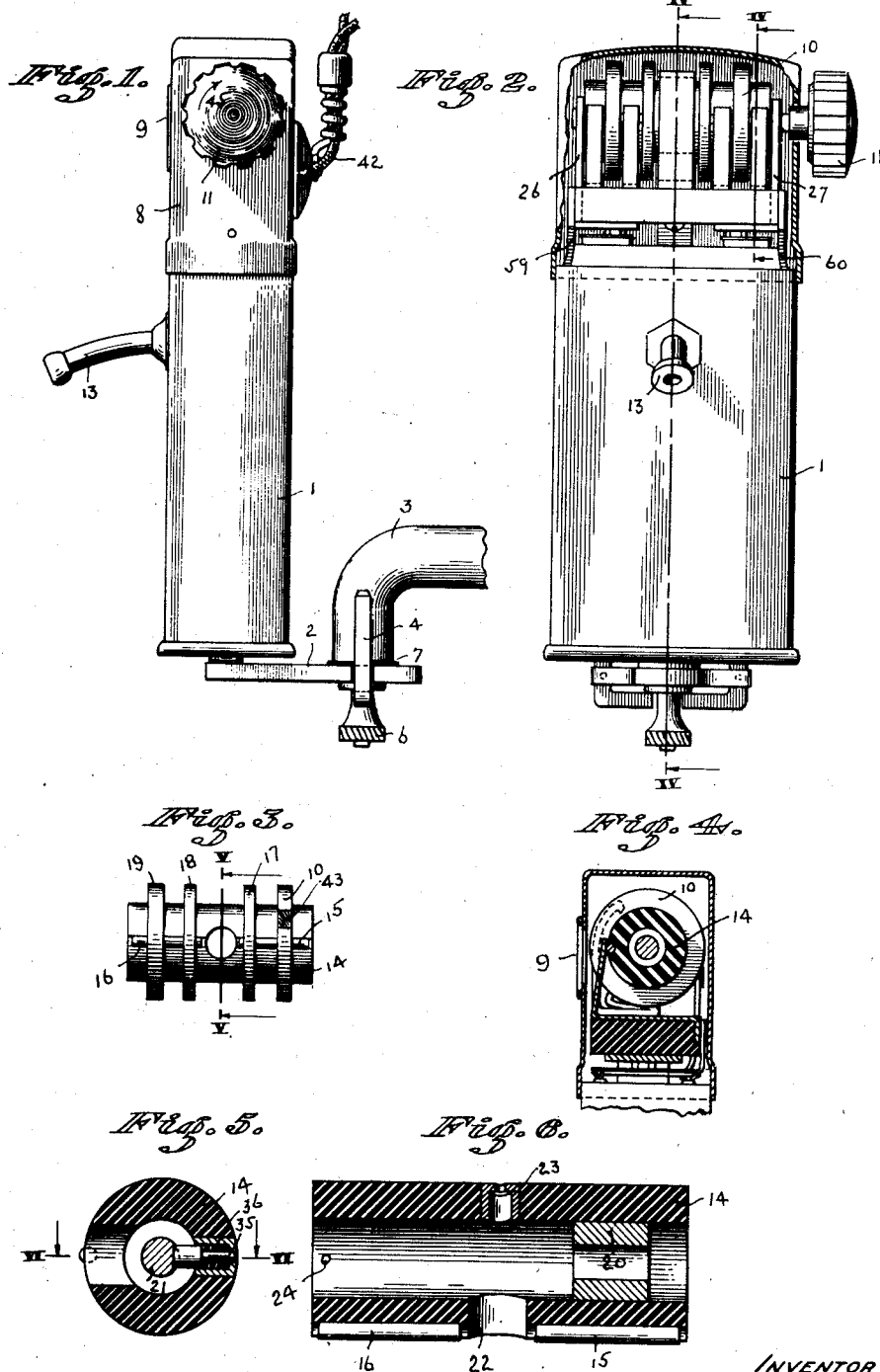
1,484,451

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ELECTRIC WATER HEATER AND SWITCH

Filed Feb. 2, 1921

2 Sheets-Sheet 1



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Fig. 7.

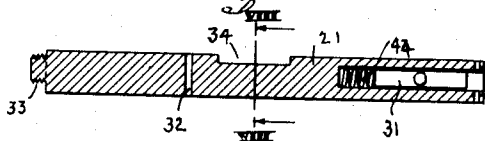


Fig. 8.



Fig. 9.

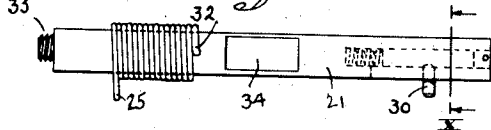


Fig. 10.



Fig. 11.

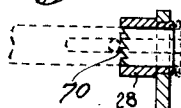


Fig. 12.

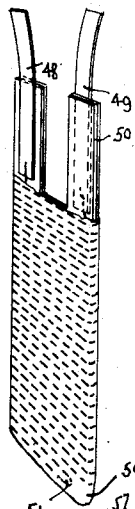


Fig. 14.

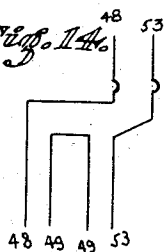


Fig. 15.

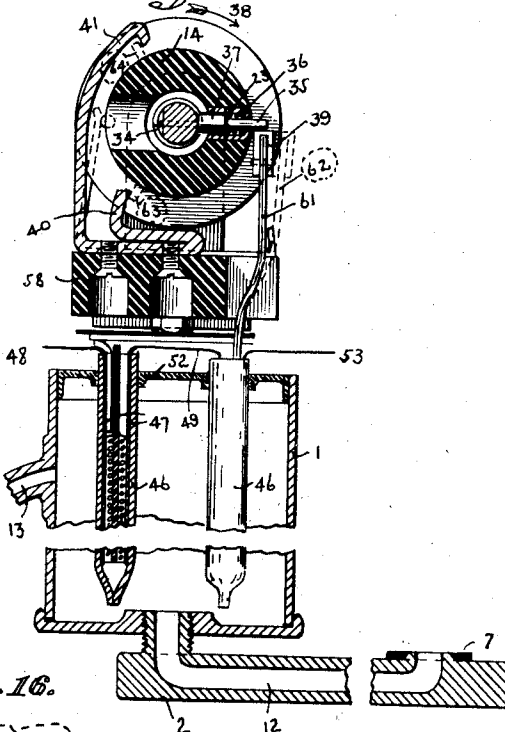


Fig. 16.

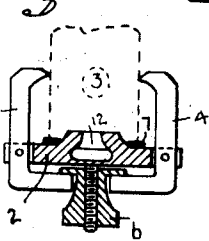
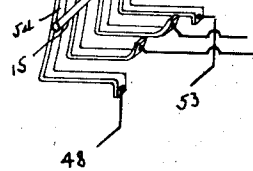


Fig. 13.



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ELECTRIC WATER HEATER AND SWITCH.

Application filed February 2, 1921. Serial No. 441,987.

To all whom it may concern:

Be it known that I, MILTON H. SHOENBERG, a citizen of the United States, and resident of the city and county of San Francisco, State of California, have invented new and useful Improvements in Electric Water Heaters and Switches, of which the following is a specification.

My invention has for its object a simple and effective water heater employing electric current from the service or ordinary socket connections found in dwellings, and incorporated therein safety means whereby overloading is automatically prevented and also switch means whereby electric current may be turned on or off at the will of the operator.

These results I attain by a casing through which the water is caused to flow, having thereon connecting means for attachment to an ordinary faucet or service pipe and within the casing a suitable electric resistance insulated from the flowing water within the casing and around the said resistance, and a suitable outlet spout through the casing. I also provide a switch mounted in combination with the resistance element whereby a flow of electric current may be interrupted at the will of the operator, and in combination with the said switch and heating element a thermal actuated latch, which under normal conditions and below a predetermined maximum temperature, the latch engages the switch so as to maintain the flow of current through the heating element, but upon the maximum permissible temperature being exceeded, as for example should the water boil out of the casing, the said latch is automatically released and the switch thereupon instantly opens the circuit, interrupting the flow of electricity and preventing damage.

Reference is herein made to my copending applications 347,732 and 347,734 filed December 27, 1919.

By referring to the accompanying drawings and following description other objects will appear and my invention will be made clear.

Fig. 1 is a side view of my invention assembled in place on the end of an ordinary faucet.

Fig. 2 is a front view of Fig. 1.

Fig. 3 is a perspective view of the switch

barrel or rotating element, and showing also the barriers adapted to rotate between the brushes and with the contact bars in place on the periphery of the barrel.

Fig. 4 is a cross section of a portion of Fig. 2 and on the line IV—IV.

Fig. 5 is an enlarged cross section through the switch barrel on the line V—V of Fig. 3.

Fig. 6 is a section of Fig. 5 on the line VI—VI thereof with certain of the interior parts removed.

Fig. 7 is a detail of the switch shaft in longitudinal cross section.

Fig. 8 is a cross section of Fig. 7 on the line VIII—VIII.

Fig. 9 is a plan view of the switch shaft showing the spring and pawl in place.

Fig. 10 is a cross section of Fig. 9 on the line X—X.

Fig. 11 is a section through one of the shaft bearings showing the support and the ratchet with which the pawl carried by the shaft is adapted to engage, and showing the pawl and shaft in dotted lines.

Fig. 12 is a perspective view of one of the heating elements and illustrating particularly the preferred manner of winding and the terminal connections.

Fig. 13 is a perspective view of the brushes and contact bars carried by the barrel of Fig. 3 and in the position which they will occupy to close the circuit through the heating elements across the brushes.

Fig. 14 is a diagrammatical showing of part of the electric connections.

Fig. 15 is an enlarged cross section of Fig. 2 on the line XV—XV thereof with a portion of the lower casing broken away and showing also the thermostatic actuation of the switch.

Fig. 16 is a detail of the holding means whereby the heater may be attached to a faucet.

Throughout the figures similar numerals refer to identical parts.

A casing adapted to enclose the heating elements and through which the water to be heated is passed is indicated by the numeral 1, from the lower portion of which there is a hollow connecting member 2 to the faucet 3 and against which faucet the device is held by the dogs 4, 5 and the clamping screw 6. Between the faucet and the member 2 may be introduced the rubber washer or suitable packing 7. Mounted on the upper

part of the casing 1 is the switch and thermostat tripping mechanism normally covered by the top 8 which is provided with a window or peak-hole 9 through which the position of the switch barrel may be readily observed to determine its position at any time. The window 9 I prefer to arrange opposite one of the insulated barriers as 10 (see Fig. 2). The switch is adapted to be 10 rotated by the exposed finger member 11.

The water flows from the faucet 3 through the channel 12 of the member 2, thence into the casing 1 and thence around the heating element and thence out through the spout 13. Referring particularly to Figures 3, 4, 5, 6, and 15 the switch barrel 14, I prefer to form of insulation material having set in its periphery a pair of contact bars 15, 16 in line with each other and each bar attached to bridge a pair of brushes. Over the periphery of the barrel 14 and spaced so as to form barriers between the said brushes I introduce the collars 10, 17, 18 and 19. The barrel 14 is drilled in an axial direction through its center and fitted with a bushing 20 which is drilled for the central shaft 21 of Figs. 7 and 8. The said barrel is also drilled at right angles to its axis with the hole 22 and fitted opposite thereto with the bushing 23 adapted to carry an escapement pin 35 and spring 36, see Fig. 15. The said barrel is also drilled in its periphery with the hole 24 for receiving the free end 25 of a coil spring (see Fig. 9). The barrel 14 is 35 is mounted on the shaft 21 shown in Figs. 7, 8, 9 and 10 and the said shaft is carried in a pair of suitable supports 26 and 27, Figs. 2, 11. The support 26 is provided with a bushing 28 formed with ratchet teeth 40 adapted to engage the pawl pin 30, of the shaft 21 which is actuated by the internal spring member 31 and spring 44 (see Figs. 7, 9 and 10). The opposite end of the coil spring above mentioned is fixed at 32 to the shaft 21 thus providing an elastic engagement between shaft 21 and barrel 14, and the finger member 11 is connected by a suitable screw threaded at 33 to the said shaft. On the shaft 21 I provide a flat portion 34 50 adapted to rotate within the circle of movement of the escapement pin 35, which pin is held in position in the bushing 23 (see Figs. 5, 15) with the spring 36 under compression against its enlarged head 37 and which head is, through the action of said spring, held in frictional contact against the shaft 21.

It will thus be seen that if the shaft 21 is rotated with respect to the barrel 14 the escapement pin 35 will remain in the expanded position of Fig. 15 until the flat portion 34 comes in line with the head 37, at which time the compression spring 36 will force the escapement pin inwardly against the flat portion and free of the restraining latch 39 65 and into the position shown in Fig. 5, when

the barrel 14 will be free to rotate in the direction of the arrow 38. During the period of rotation of the shaft 21 and before the flat portion 34 has rotated under the head 37 the coil spring 25, 32 will have been wound up to cause a rotative impulse to the barrel 14 which has heretofore been restrained from movement by the pin 35 engaging the latch 39 but when the said pin has been retracted the barrel will then rotate carrying with it the commutator bars 15 and 16, which will now be rotated away from their brushes and any circuit previously existing will be interrupted.

The rotation of the barrel 14 will continue until the pin 35 being now forced outward by riding on the circular periphery of the shaft 21 over which it is now traveling, has arrived at the stop 40. A further rotation of the finger member 11 causes the winding of the spring and rotation of the shaft 21 until the flat portion 34 again comes under the head 37 of the escapement pin, when the latter is again retracted and the barrel 14 rotates in the direction of the arrow 38 until the escapement pin engages the stop 41 in the same manner as above described. When the pin 35 is against the stop 40 or against the stop 41, no current is flowing through the circuit controlled by the switch. When the escapement pin is in contact, however, with the restraining latch 39 the bars 15, 16 bridge the brushes 54, 56, and 55, 57 and the circuit under the control of the switch is energized from the electric service connection 42 (Figs. 1 and 13). When the circuit is energized the barrier 10 exposes a suitable indication in front of the window 9 showing the electrical condition of the circuit.

Referring particularly to Figs. 7, 8, 9, and 10, the shaft 21 is bored on one of its ends and provided with the internal spring 44 which actuates the pawl 30, the latter being slidable in a groove cut through the said shaft so that the end 30 engages the teeth of the ratchet 28 of Fig. 11, thus preventing the backward rotation of the shaft but permitting only its forward rotation in the direction of the arrow 38 and winding of the spring 25, 32.

One of the heating elements is shown removed from its sheath and with the insulation partly stripped therefrom in Fig. 12. In the form of heater illustrated there are two of these heating elements connected in series and each of them is slid into a sheath member 46, 46 from which it is insulated by the sheet insulation 47 (see Fig. 15). These elements are formed by winding a long resistance wire loop, the two ends of which are connected to the terminals 48, 49, respectively, and the loop then wound as a double wire about the base member or insulation 50 for which I prefer to employ mica (see Fig. 130

12). The terminal of the loop is shown at 51 and may be fixed in a notch in the mica or otherwise secured.

After winding the wire as indicated in Fig. 12 the entire surface is preferably given a coating of cement or other fixing material whereby the wire is prevented from slipping. I then place over each side of this winding insulating sheets 47, 47 and slip the entire element within the sheath 46. This sheath I prefer to form of a piece of tubing flattened on its sides and pinched and soldered on its lower end. The sheath is then slipped through the cover plate 52 and soldered around its upper edge thereto. The plate 52 is also preferably soldered to the casing 1, thus leaving the open ends of the sheath tubes open to the outside of the casing and hermetically sealed from any water ingress. The terminals as 48, 49 are now connected above and outside entirely of the casing, so that the two heating elements are in series between the terminals 53, 48. These are then connected up with the brushes 54, 55 (see Figs. 13, 14). The remaining two brushes 56, 57 are then connected with the main supply 42 so that when the bars 15, 16 are rotated by the switch barrel 14 into the position indicated at Fig. 13 the heating elements are energized from the circuit 42. It is to be understood that the several switch parts and brushes are assembled on the insulated base 53 which is mounted in spaced relation with the casing 1 and top 52, by the spacing and supporting members 59 and 60, Fig. 2.

The thermostat member 61, Fig. 15, is formed of two strips of different metals welded or soldered together and having different coefficients of expansion and the lower end of this strip is fixed adjacent to one of the heating elements as to the sheath 46, so that the strip 61 derives a heating influence from a heating element, and due to the different expansion coefficients of the two metals of which the strip 61 is formed, it will, upon excess heating, move into the dotted position 62, and at such time will release the barrel 14 to rotate in the direction of the arrow 38 until the stop 40 is reached or approximately one-third of a revolution, breaking the circuit which has heretofore energized the heating elements. These will now undergo cooling and the strip 61 will return from the dotted position 62 to the position 61, carrying the latch 39.

It will be noticed that I have shown two stops 40 and 41, Fig. 15, and the pin 35 may take either of the dotted positions 63 or 64 or the full line position 35 corresponding with three angular positions of the switch barrel 14 at intervals of approximately 120 degrees. These two stops are provided for the reason that if the thermostat has shifted the latch 39 into its dotted position thus

clearing the escaping pin the barrel 14 will rotate until the pin 35 comes into the dotted position 63. If it were not for the stop 41, and while the thermostat is still hot the operator rotates the finger member 11 winding the spring 25, 32 until the flat portion 34 of the shaft 21 releases the escapement pin from its position 63 the barrel 14 would make a complete revolution and at the expiration of such complete revolution (in case the shaft 21 had not in the meantime been rotated) the restraining pin would again come opposite the flat portion 34 and the said pin be withdrawn and the barrel would continue to rotate until the spring had unwound, thus leaving the barrel 14 in some arbitrary position which might in some cases correspond with a closed circuit. This would clearly be detrimental and hence the second stop 41 is provided so that under the abnormal condition of the latch 39 clearing the pin 35 under the action of the thermostat the barrel will advance 120 degrees to position 63. The second operation could only advance the barrel another 120 degrees or until the pin took the position 64 against the stop 41 and further operation, if the block 39 is in its outer or dotted position, would cause a maximum rotation of 240 degrees or back to the position 63 making the movement positive and always to a position of neutrality or open circuit if the restraining latch 39 has been moved outward due to the excess heating of the thermostat element 61.

The operation will be as follows:

Referring to Fig. 1 the assembled heater is attached to the faucet 3 by the clamping dogs 4, 5 against the faucet by the action of the clamp screw 6. Water is now turned through the faucet and will travel through the passageway 12 into the casing 1 and around the sheaths 46, 46 and out through the spout 13. If it is now desired to heat the water, the finger member 11 is rotated in the direction of the arrow 38 and until the signal 43 on the barrel 10 (see Figs. 3, 4) and observable through the window 9, indicates a closed circuit. The parts will then be in the position indicated in Fig. 15. Current will now flow through the electric service cord 42, brush 56, bar 15, brush 54, through the heating elements in series, and out at 53 through the brush 55, bar 16 and to the other brush 57, thus completing the circuit. The resistance wire of the heating elements will now cause a heating of the walls of the sheaths 46, 46 and will therefore heat the water flowing in contact therewith. If now the water flow be shut off from the faucet 3 the body of water contained in the casing 1 will become excessively hot and will in a few seconds boil away from the upper portion of the casing at which time the thermostat element 61 will become excessively hot, causing a movement outward to the dotted

position 62 and the release of the restraining latch 39 from the pin 35 at which time the spring 25, 32 causes the rotation of the barrel 14 through a movement of 120 degrees or into an open circuit position, thus automatically interrupting the flow of current. If at any time the switch be rotated by the finger member 11 into the closed position without water actually flowing within the casing 10 the thermostat 61 will immediately act to automatically interrupt the closed circuit, before any dangerous or burnout condition can be reached.

I claim:

1. An electric heater comprising a metallic sheath open at the top and extending into a casing through which a fluid is adapted to flow and sealed to prevent the entry of said fluid in said sheath, an electric resistance element inserted into said sheath and connections thereto introduced through said open top, a thermostat element constructed and adapted to move a latch under temperature variations and a switch adapted to make or break an electric circuit through said resistance, an escapement pin associated with said switch and adapted to engage said latch when said thermostat is below a predetermined temperature and which is released therefrom by the movement of said latch when said temperature is exceeded and spring means by which said switch is moved into open circuit position whenever said latch clears said pin.
2. An electric heater comprising a metallic sheath open at the top and extending into a casing through which a fluid is adapted to flow and sealed to prevent the entry of said fluid in said sheath, an electric resistance element inserted into said sheath and connections thereto introduced through said open top, a thermostat element constructed and adapted to move a latch under temperature variations and a switch adapted to make or break an electric circuit through said resistance, an escapement pin associated with said switch and adapted to engage said latch when said thermostat is below a predetermined temperature and which is released therefrom by the movement of said latch when said temperature is exceeded and spring means by which said switch is moved into open circuit position whenever said latch clears said pin and a plurality of stops each corresponding to

open circuit positions of said switch and adapted to engage said pin, and finger operated means by which said switch may be moved from any stop or said latch into the next stop position.

3. An electric heater comprising a metallic sheath open at the top and extending into a casing through which a fluid is adapted to flow and sealed to prevent the entry of said fluid in said sheath, an electric resistance element inserted into said sheath and connections thereto introduced through said open top, a thermostat element constructed and adapted to move a latch under temperature variations and a switch adapted to make or break an electric circuit through said resistance, an escapement pin associated with said switch and adapted to engage said latch when said thermostat is below a predetermined temperature and which is released therefrom by the movement of said latch when said temperature is exceeded and spring means by which said switch is moved into open circuit position whenever said latch clears said pin and a plurality of stops each corresponding to open circuit positions of said switch and adapted to engage said pin, and finger operated means by which said switch may be moved from any stop or said latch into the next stop position said switch comprising a cylindrical member mounted on a shaft and a spring therebetween and finger operable means for rotating said shaft, contact bars on said cylindrical member adapted to contact with brushes to establish a circuit through said heating element.

4. An electric heater as set forth in claim 3 wherein said escapement pin is located in said cylindrical member and is actuated by said shaft.

5. An electric heater as set forth in claim 3 wherein said escapement pin is located in said cylindrical member and is actuated by said shaft and a spring normally holding said pin against the periphery of said shaft.

6. An electric heater as set forth in claim 3 wherein said escapement pin is located in said cylindrical member and is actuated by said shaft and a spring normally holding said pin against the periphery of said shaft and standards supporting said shaft and a ratchet and pawl between said shaft and one of said standards.

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