My invention relates to heaters, and more particularly to electrical devices for heating water, the principal objects of the invention being to facilitate and reduce the expense of producing water heaters, to promote safety in the use of water heaters, to prolong the useful life of heaters, and to facilitate the cleaning of heating elements whereby the effectiveness of a heater may be easily maintained.

The invention is particularly applicable to electrical heaters for hot water bottles, in which electrodes are mounted in bottle caps, and for this purpose has for a further object to reduce the hazard to users of heaters supported by hot water bottle caps.

Further objects of the invention are to control the extent to which water is heated by devices of his character, to adapt a water heater for total immersion in water, and to embody a thermostat in a heater adapted for total immersion.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a vertical section through the center of the neck portion of a hot water bottle and a heater mounted therein embodying my invention.

Fig. 2 is a perspective view of the heater illustrating a thermostat thereon, and a cover, shown disassembled.

Fig. 3 is a detail perspective view of thermostat members disassembled.

Fig. 4 is a cross section of the heater on the line 4—4, Fig. 1.

Referring in detail to the drawings:

1 designates a rubber hot water bottle of usual construction having an internally threaded neck 2 provided with a shoulder 3.

My invention includes a plug or cap 4 comprising a cylindrical body consisting of non-conductive material moulded to form the body, and having an externally threaded portion for screwthreadedly mounting the body in the neck to close the bottle.

The lower end of the body is formed to provide an axial cylindrical recess 6 extending from the lower end of the body substantially to the threaded portion and has elongated slots 7 and 8 providing registering lateral openings into the recess on diametrically opposite sides of the body, and a passage through the body.

Fixed in the recess 6 are electrodes 9 and 10 formed preferably of carbon, and substantially semi-cylindrical in cross section, the arcuate outer faces of the electrodes engaging the inner wall of the body and the straight inner faces 11 of the electrodes lying flush with the aligned walls of the slots 7 and 8.

Conductors 12 and 13 comprising relatively heavy wires or bars are embedded in the body, and have lower ends projecting into the recess and secured to the electrodes, and preferably embedded therein. The upper ends of the conductors project beyond the upper end of the body to form terminals or contact posts that may be inserted in a suitable socket for setting up flow of current through the heater.

The upper end of the body is enlarged to form a shoulder 14 seatable on the shoulder of the bottle neck and to accommodate the upper ends of the conductors which are relatively widely spaced suitably for connection with contacts in an electrical circuit.

The device may include further a thermostatic element 15 comprising halves 16 and 17 adapted to form a casing and normally engaged contact bars 18 and 19 therein. One of the bars is adapted to move away from the other when heated to a predetermined degree. The casing is located on the upper end of the body between the terminals. The bars are connected respectively to the terminal of the conductor 12 and to a wire 20 of a circuit-forming cord 21, the other wire 22 of the cord being connected to the opposite terminal at 23 for completing the circuit through the electrodes and thermostat.

A cylindrical cap 24 having an internal annular groove 25 at its lower edge for mounting the cap on the upper end of the body is adapted to cover the thermostat and terminals. The end wall 26 of the cap is provided with a central aperture 27 to admit
the cord to the recess of the cap, and means such as a bushing 28 seals the cord in the opening to prevent entrance of moisture into the cap.

Recesses or sockets 29 and 30 formed in the end wall 26 have reduced bottom openings 31 for admitting the outer ends 32 of the terminals to the sockets, said ends being threaded to receive nuts 33 seated on the shoulders formed by reason of the reduced diameter of the openings in the bottoms of the sockets.

The ends of the terminals and the nuts are thus countersunk in the end wall of the cap, and sealing material 34, for example a composition including rubber, is packed into the sockets to prevent entrance of moisture to the terminals.

The cord may be provided with a plug 35 for attachment to a socket member in an electrical circuit.

The device when particularly adapted for mounting in the neck of a water bottle will preferably consist only of the moulded body, the electrodes, and, terminals adapted to serve as posts to receive a plug in an electrical circuit.

The recessed end of the body will extend into water in a bottle in which the heater is mounted, and the water will conductively connect the electrodes, thus completing a circuit. The water heated in the space between the electrodes will pass from the body, and circulation of water through the slots and between the electrodes will be maintained while current is being supplied to the terminals, to raise the temperature of the entire body of water in the bottle.

The circulation of the water over the carbon electrodes and electrification of the water between the electrodes will tend to clarify and purify the water. The slots of the body, and the location of effective flat faces of the electrodes in registry with the slot walls facilitate access to the electrodes for cleansing the same.

I have found that the temperature of the water heated by the current passing between the electrodes, may be controlled by varying the size of the electrodes. I therefore provide electrodes of suitable size to raise the temperature of the water to a predetermined degree, and maintain the water at a selected temperature, and which will not heat the water beyond the selected temperature.

The electrodes may be limited to limit the heat effect, for example, to a length of approximately one-half of an inch, each having an effective area on its flat face of approximately one eighth of a square inch, whereby the heater would raise the temperature in a quart bottle very slowly to approximately 120 degrees F.

Water is preferably heated to approximately the desired temperature before being introduced into the bottle, and the heater will then maintain the desired temperature. If the water is pre-heated beyond the desired temperature, it will cool to the limit of heating for which the electrodes are adapted, while in the bottle and subject to the heater.

Control of temperature of water in hot water bottles by variation in the size of electrodes is preferred, since failure of a thermostat to operate might result in overheating the water and cause an explosion.

When the heater is particularly adapted for complete immersion in water, for example in a dish or open-mouth vessel, and to heat the water quickly, the thermostatic element responsive to water temperature is included, and relatively large electrodes are employed and the current will be automatically shut off at a predetermined degree of heat in the thermostat.

The sealing up and packing of terminal ends afford a water tight cover for the heater, so that the entire assembly including the end of the cord adjacent the bottle may be immersed in water while the heater is energized without danger of short circuiting.

What I claim and desire to secure by Letters Patent is:

1. An electric water heater comprising a solid body of insulating material adapted to be inserted in the neck of a hot water bottle and provided with an integral upper handle portion and having a lower depending tubular portion provided with spaced longitudinal slots, and a pair of spaced electrodes molded in the solid body and extending entirely through and projecting above the body to provide spaced terminals and having their lower portions exposed within the depending tubular portion of the body.

2. An electric water heater comprising a solid body of insulating material adapted to be inserted in the neck of a hot water bottle and provided with an integral upper handle portion and having a lower depending tubular portion provided with spaced longitudinal slots, a pair of spaced electrodes molded in the solid body and extending entirely through and projecting above the body to provide spaced terminals and having their lower portions exposed within the depending tubular portion of the body, and a thermostat arranged upon and supported by the upper end of the body and located between and connected with the said spaced terminals of the electrodes.

In testimony whereof I affix my signature.

WILLIAM KENT KISE.