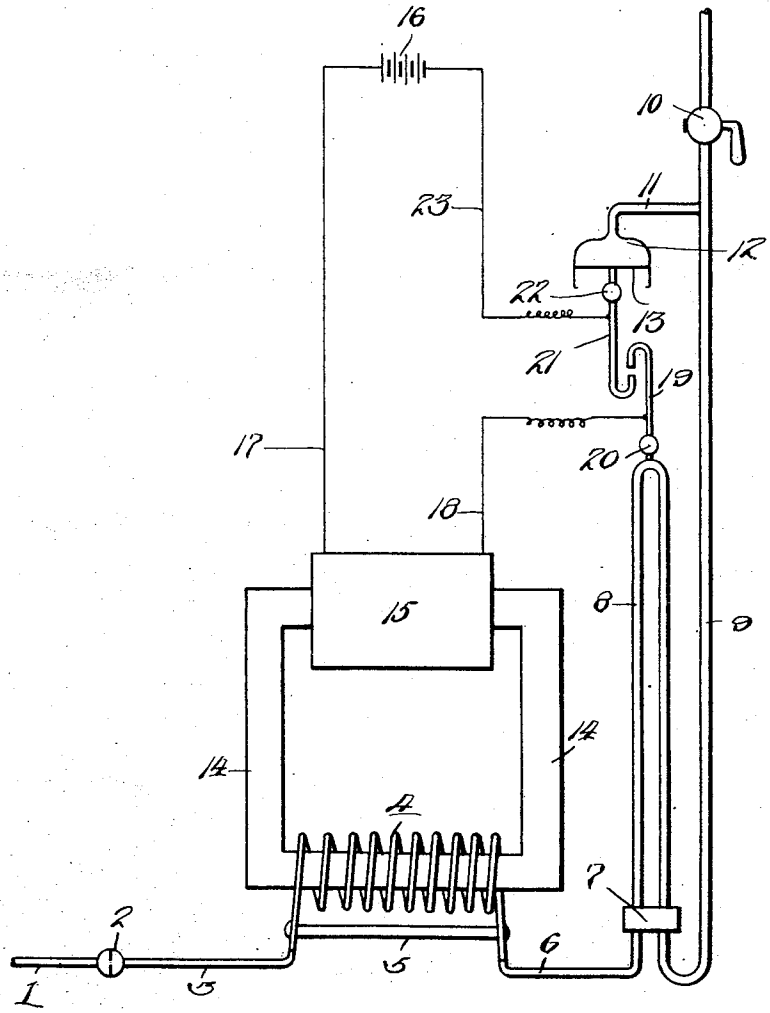
W. O. SNELLING.

ELECTRIC WATER HEATER.

APPLICATION FILED AUG. 24, 1920.

1,402,021. Patented Jan. 3, 1922.



Walter O. Snelling.
Inventor.

UNITED STATES PATENT OFFICE.

WALTER O. SNELLING, OF ALLENTOWN, PENNSYLVANIA.

ELECTRIC WATER HEATER.

1,402,021. Specification of Letters Patent. Patented Jan. 3, 1922.

Application filed August 24, 1920. Serial No. 405,744.

To all whom it may concern:

Be it known that I, WALTER O. SNELLING, a citizen of the United States, residing at Allentown, in the county of Lehigh and State of Pennsylvania, have invented certain Improvements in Electric Water Heaters, of which the following is a specification.

My invention relates to improvements in water heaters, and more particularly relates to an improved water heater in which an electric current produced by induction is used as a means of heating a stream of water.

The ordinary forms of water heaters employing wire of high resistance as a heating means are open to objection, because of the readiness with which most forms of resistance wire deteriorate when operated under the severe conditions met with in a water heater. One object of my invention is to provide a means of heating water through the aid of electricity, without the use of wire of high resistance. Another object of my invention is to provide an electrical water heater of great capacity and flexibility, and one which will efficiently utilize a large percentage of the electrical energy consumed by the apparatus.

The drawing accompanying this specification represents somewhat diagrammatically one form of apparatus embodying the principles of my present invention. 1 is a pipe connected with a source of water supply under pressure, 2 is an orifice valve connecting pipes 1 and 3. 4 is a coil of pipe forming a secondary of transformer 14, this coil of pipe being preferably of copper or other metal of high electrical conductivity. 5 is a connecting rod, for the purpose of short-circuiting the two ends of coil 4, and should also be preferably made of metal of high electrical conductivity. 6 is a short length of pipe connecting coil 4 with an expansion tube 8, this expansion tube being made in the form of a long inverted U, held firmly in place by a clamp 7. 9 is a pipe leading from expansion tube 8 to any place at which a supply of hot water may be desired. 10 is a valve attached to pipe 9, and 11 is a connecting pipe leading off from pipe 9, and communicating with a bell-shaped vessel 12, provided with a diaphragm 13. 15 is the primary coil of transformer 14, this primary coil being connected with a source of alternating current 16. 17 is a wire connecting primary coil 15 with one terminal of the source of electric current 16, and 18 is a wire connecting coil 15 with contact point 19. 20 is an insulating member, to prevent electrical connection between contact 19 and expansion tube 8. 21 is also a contact point, mechanically connected with diaphragm 13, but electrically insulated from this diaphragm by insulator 22. 23 is a wire connecting contact 21 with the other terminal of the source of electric current 16.

In the operation of the form of apparatus illustrated, water from a service supply under pressure passes through pipe 1, orifice valve 2, pipe 3, coil 5, pipe 6, expansion tube 8 and supply pipe 9, to valve 10 and to any connected pipes for supplying hot water. Assuming valve 10 to be closed, a uniform condition of pressure is very quickly reached through the entire system of piping, and this pressure causes diaphragm 13, insulator 22 and contact 21 to assume a certain definite position, which normally is such that a slight gap is left between contact point 21 and contact point 19. No current will flow through wire 17, coil 15, wire 18, contact point 19, contact point 21, or wire 23, as long as such gap exists between contact points 19 and 21. If however valve 10 is opened, so as to allow water to flow, the pressure in the system will at once be reduced, the size of the orifice in orifice valve 2 being such as to insure a reduction of pressure occurring whenever a normal flow of water is permitted by the opening of a service valve. This reduction in pressure will cause diaphragm 13 to become depressed, bringing contact points 19 and 21 together, and permitting current to flow through coil 15 of transformer 14. A very strong current will at once be induced in coil 4 and through connecting rod 5, and the temperature of coil 4 will rise rapidly, heating the water which is passing through it. This heated water will pass on through expansion tube 8, expanding this tube and increasing its length. If the temperature of coil 4 becomes too great the expansion of expansion tube 8 will become sufficient to again separate contact points 19 and 21, and these contact points will also be separated if the flow of water through the apparatus is shut off by closing the valve 10.

In the operation of the device as described, no current will pass from the source of supply 16 through primary coil 15, unless water is being drawn from the supply pipe, and current will at once be shut off when the water is no longer being drawn, and will

also be shut off if hot water is being drawn so slowly as to cause too high a temperature in the apparatus. It is of course evident that the distance between the contact points 19 and 21 can be made adjustable, so as to permit an electric circuit to be established by any desired difference of water pressure in the system, and to be broken whenever any desired temperature, is reached by the water in expansion tube 8.

It is advantageous to imbed coil 4 and connecting rod 5 in a heat insulating covering of magnesia or other suitable insulating material, and this heat insulating material should separate coil 4 from the core of the transformer, in order to prevent heat loss. Apparatus constructed in accordance with my present invention is substantially free from fire hazard, and is extremely efficient in utilizing electrical energy in the heating of water. Electric current is consumed only when hot water is required, and in proportion to the amount of hot water which is drawn off.

Instead of expansion tube 8, a solid expansion member lying within coil 4 may be employed, this expansion member serving the same function as expansion tube 8 however, and being used to break the electrical circuit whenever any desired temperature is reached by the water. Instead of the bell-shaped vessel 12 and diaphragm 13, it is of course evident that a bent tube similar to that used in an ordinary pressure gauge may be used, the bending of this tube under differences of pressure being employed to make or break the electrical circuit through primary coil 15 of transformer 14. It will also be evident that a piston may be substituted for diaphragm 13, although the use of a diaphragm possesses certain advantages in freedom from leakage.

Instead of depending upon the elasticity or resiliency of diaphragm 13 to move contact point 21 on reduction of pressure within the apparatus, it will of course be evident that a spring or other suitable member may be employed, or two springs operating in opposite directions upon diaphragm 13 may be used, the tension of either one or of both of these springs being adjustable. It will also be evident that any of the customary means of preventing arcing and sparking between contact points 19 and 21 may be employed in conjunction with the operation of the present device, or an electrical switch may be employed, actuated by contact points 19 and 21, only sufficient current being employed in the circuit comprising contact points 19 and 21 to operate such switch, the switch in turn making and breaking the electrical circuit between the source of electrical current 16 and coil 15.

It will accordingly be evident that many equivalents may be employed, without departing from the spirit of my present invention, and accordingly no limitations are to be imposed except such as are indicated in the appended claims.

I claim as my invention:

1. An electrical water heater comprising a coil of tubing containing water forming the secondary winding of an electrical transformer, a coil of wire forming the primary winding of such a transformer, and means for energizing said primary coil operated by the passage of water through the apparatus.

2. An electrical water heater comprising a coil of tubing containing water forming the secondary winding of an electrical transformer, means of energizing said primary coil when water passes through the apparatus, and means for controlling the electrical current energizing said primary coil through temperature changes existing in said coil of tubing.

3. An electrical water heater comprising a coil of wire forming the primary winding of an electrical transformer, a coil of tubing containing water forming the secondary winding of such transformer, and means for controlling the passage of electric current through the primary coil through a change in either the temperature or the pressure of the water in the secondary tubing.

4. An electrical water heater comprising a coil of tubing containing water, means for inducing an electric current through such coil, and means for controlling such electric current through changes in either the temperature or the pressure of the water.

5. An electrical water heater comprising a coil of tubing containing water, and means for inducing an electric current through such coil when the pressure of the fluid in such coil is reduced.

6. An electrical water heater comprising a coil of tubing containing water, means for inducing electric current through such coil when water is withdrawn, and means for controlling said electric current by the temperature of said coil.

In testimony whereof, I have hereunto subscribed my name this 2nd day of July, 1920.

WALTER O. SNELLING.