No. 798,300. PATENTED AUG. 29, 1905.

E. E. SAGER.

ELECTRICAL WATER HEATER.

APPLICATION FILED FEB. 14, 1905.

Fig. 1.

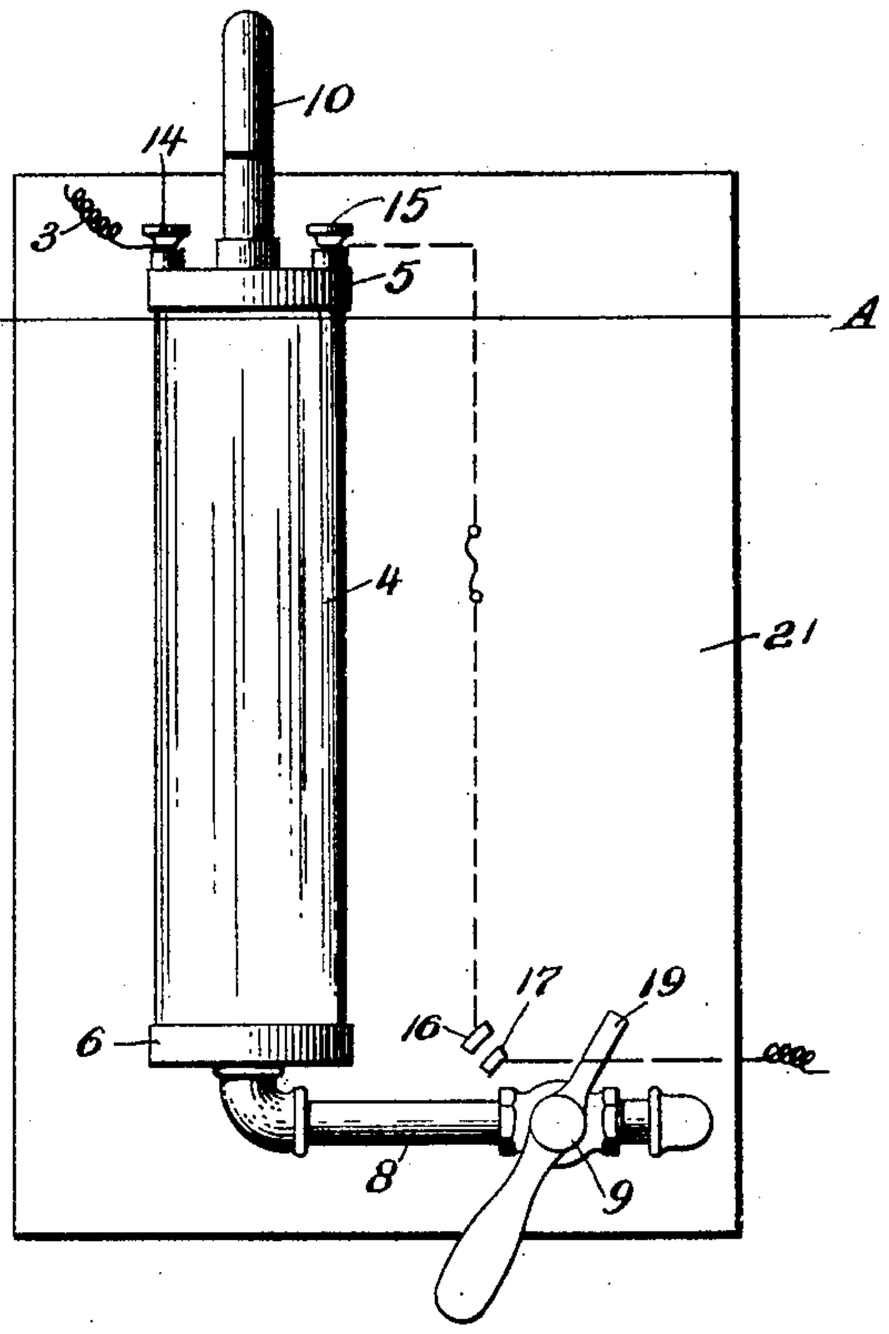


Fig. 2.

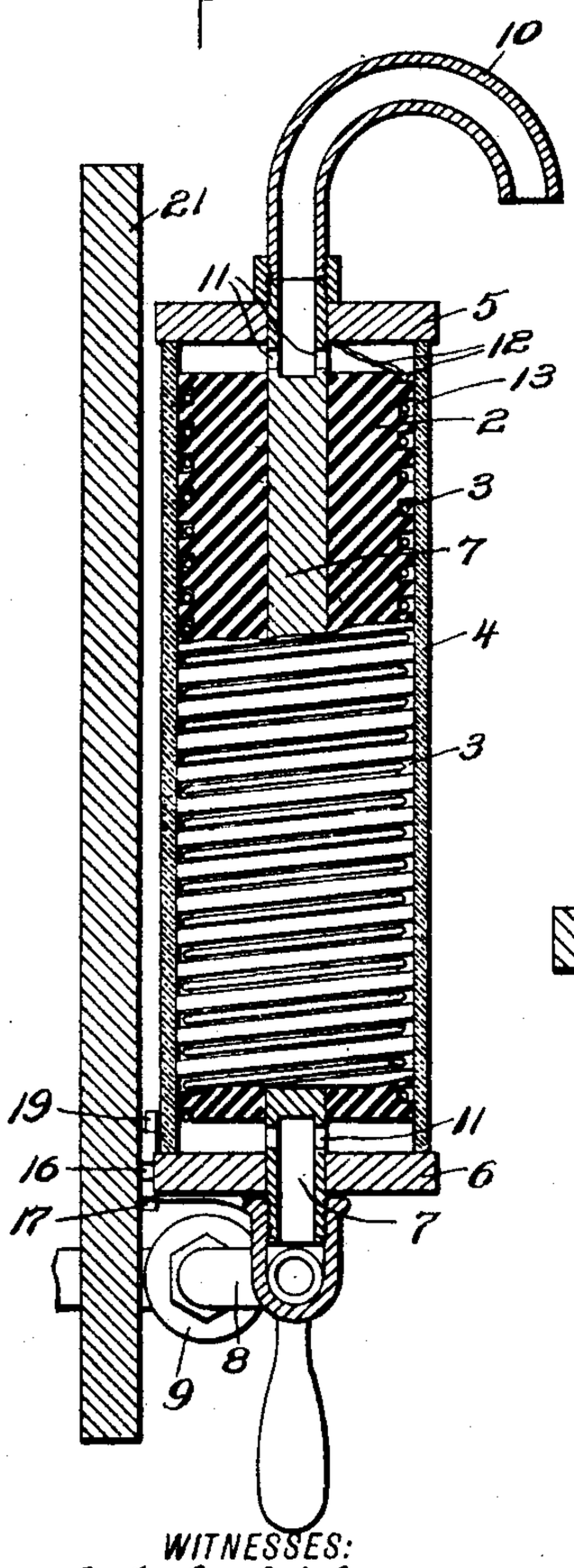
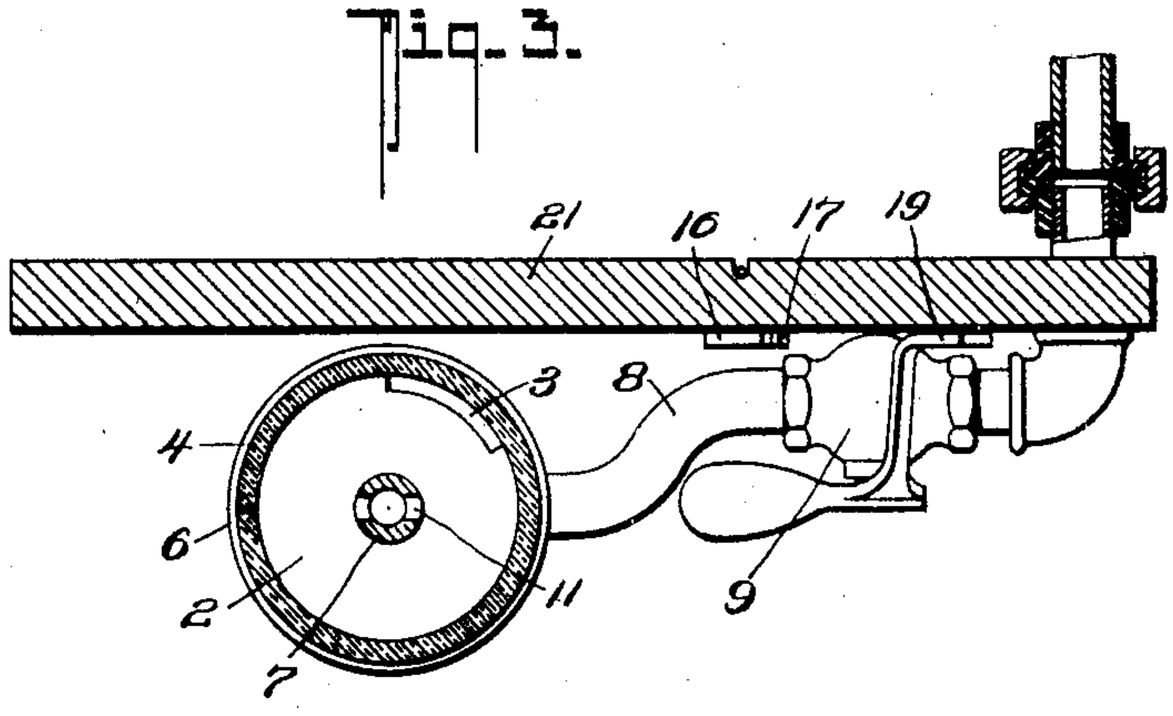


Fig. 3.



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ELI E. SAGER, OF VANCOUVER, CANADA.

ELECTRICAL WATER-HEATER.

No. 798,300. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed February 14, 1905. Serial No. 245,558.

To all whom it may concern:

Be it known that I, ELI E. SAGER, a citizen of the United States of America, residing at the city of Vancouver, in the Province of British Columbia, Canada, have invented new and useful Improvements in Electrical Water-Heaters, of which the following is a specification.

This invention relates to an improved means for heating water by means of a current of electricity passing through a coil of wire of high resistance; and my object has been to reduce possible leakage of the electric current by short-circuiting, &c., to reduce as far as practicable the volume of water exposed to the heating effect of the current and to avoid the possibility of the current being turned into the coil when no water is surrounding it. The manner in which it is proposed to effect these purposes is to coil the heating-wire on a core of non-conducting material, the wire being laid in spiral grooves in the core, so that the adjacent coils will be separated from one another by a non-conductor, and the water will be constrained to flow as much as possible through the spiral of the groove. The grooves will also be double-pitched and the wire double-wound, so that the current of adjacent wires shall be passing in opposite directions. I also connect the switch by which the coil is opened to the external circuit to the handle which operates the stop-cock of the water-supply to insure that the heating-coil is surrounded with water before the electric current is passed through it.

The invention is fully described in the following specification and illustrated in the drawings which accompany it, in which—

Figure 1 is a front elevation of the heater and switchboard; Fig. 2, a vertical section through the heater and part elevation of the switch; Fig. 3, a cross-section on the line A A in Fig. 1.

In the drawings, 2 represents a core of volcanic lava or other suitable insulating material, around which double-pitched spiral grooves 3 are carried from end to end, which grooves are preferably square in cross-section. This core is inclosed in an outer casing 4, of glass or other suitable material, which fits the core as closely as practicable. The ends of the outer casing 4 are closed by end pieces 5 and 6, which are drawn tightly on the ends of the casing, so as to form water-tight joints thereon, by a member 7, which passes through the core 2 and the end pieces 5 and 6 and is provided with nuts at top and bottom or other suitable means for drawing the parts together and tightening the end joints, jointing material being introduced, if necessary, to effect the sealing. The member 7 is provided with a central aperture at each end, which apertures are connected with the water-space within the casing by apertures 11, drilled through the member 7. The lower end of the central stem 7 is connected to the water-service by a pipe 8, in which is a stop-cock 9, and to the upper end of 7 a water-delivery pipe 10 is secured.

A wire offering a high resistance to the passage of an electric current is connected through one of the end pieces 5 or 6 to the terminals 14 and 15, one coil 12 of the wire being laid in one groove of the double-pitched spiral 3 of the core and crossing at the opposite end is brought up the other groove of the spiral in the coil 13. The ends of the coil-wire, being carried through suitable insulation in the end piece 5, are connected to terminals 14 and 15. To one terminal 14 is connected the wire 30 of the external circuit, and the other, 15, is connected on the switchboard 21 to one of the plates 16 of the switch, by which the current is passed through the heating-coils 12 13 when desired, the other plate 17 being connected to the other terminal of the external circuit. The contact-plates 16 and 17 are bridged by a switch-bar 19, forming an extension of the handle 20 of the stop-cock 9, the position of the switch-bar 19 being so set in relation to the port in the plug of the cock 9 that the port will be opened for the passage of water before the switch-bar 19 bridges the plates 16 and 17 and permits the current to pass through the coil.

The water-heater vessel and its connections to the water-service will be properly insulated to avoid current leakage and the switchboard 21 provided with the necessary safety-fuses. To further avoid leakage or short-circuiting of the current through the water, after coiling of the wires on the core the whole may be dipped in a varnish which is a non-conductor of electricity, but which at the same time will not offer any serious hindrance to the passage of heat through it.

Having now particularly described my invention and the manner of its application, I hereby declare that what I claim as new, and desire to be protected in by Letters Patent, is—

1. In an electrical water-heater, a core of non-

conducting material having double-pitched spiral grooves, a wire coiled in one groove from end to end and returning in the other, the terminals of which wire are connected to the terminals of an external electric circuit, a casing inclosing the coil comprising a tubular portion fitting as closely as practicable, the cross-section of the core, and two end portions jointed water-tight on the ends of this tubular portion, a rod or stem passing through the center of the core and the ends of the casing, the ends of which stem are each provided with a central aperture communicating with the space within the casing at the ends of the core, means for tightening the ends of the casing upon the tubular portion thereof, means for connecting the water-service to one end of the central stem and means for delivering water from the other end.

2. In an electrical water-heater, a casing formed of insulating material and having supply and discharge pipes, an insulating-core within said casing and abutting the side walls of the casing, said core having spiral channels extending its length, a resistance-coil extending through said casing and in said spiral channels, supply and discharge pipes connecting with the chamber at each end, said spiral passages being of sufficient depth to permit the passage of water therethrough from one end of the casing to the other, and connections whereby an electric current is passed through said coil.

3. In an electrical water-heater, a casing composed of insulating material and having conducting ends, supply and discharge pipes connecting with said ends of the casing, an electric resistance-coil extending between the conducting ends of the casing and in direct contact with the fluid, means for causing the fluid to flow from one end of the casing to the other end in spiral streams following the direction of the winding of the resistance-coil, and conducting-wires extending from the casing to a source of electrical energy.

4. In an electrical water-heater, an insulating water-chamber, supply and discharge pipes connected therewith, an electrical resistance-coil extending through the chamber from end to end, conducting-wires connected with the coil, a controlling-switch with which one of said wires connects, a cock to control the flow of water through the chamber, said cock having an operating-handle forming a part of the controlling-switch whereby the switch will be opened before the cock is closed and vice versa, and means within the water-chamber for directing the water in a spiral course following the direction of the winding of the resistance-coil, substantially as shown and described.

5. In an electrical water-heater of the class described, a water-chamber, an inlet-pipe at one end of said chamber and an outlet-pipe at the other end thereof, an insulating-filling for said water-chamber of less length than the water-chamber to form water-compartments at each end of the water-chamber, said insulating-filling having spiral channels on its periphery communicating with said water-compartments to permit passage of the water from one compartment to the other through said spiral channels, a resistance-coil wound in said spiral channels, means for connecting said resistance-coil to a source of electrical energy, a switch in said electric connection, a water-inlet pipe communicating with one of the water-compartments of the water-chamber and an outlet-pipe communicating with the other water-compartment of the water-chamber, a cut-off valve having an operating-handle forming a part of said switch and arranged to close the electric circuit after the valve has been opened, all being arranged substantially as shown and described.

6. In an electrical water-heater of the class described, a water-chamber, an inlet-pipe at one end of said chamber and an outlet-pipe at the other end thereof, an insulating-filling for said water-chamber of less length than the water-chamber to form water-compartments at each end of the water-chamber, said insulating-filling having spiral channels on its periphery communicating with said water-compartments to permit passage of the water from one compartment to the other through said spiral channel, a resistance-coil wound in said spiral channels, means for connecting said resistance-coil to a source of electrical energy, a switch in said electric connection, a water-inlet pipe communicating with one of the water-compartments of the water-chamber and an outlet-pipe communicating with the other water-compartment of the water-chamber, a cut-off valve having an operating-handle forming a part of said switch and arranged to close the electric circuit after the valve has been opened, and a rod passing through said insulating-filling within the water-chamber from end to end, said rod having tubular portions at its ends in communication with the inlet and outlet pipes and having said tubular ends provided with perforations in communication with the water-compartments of the water-chamber, all being arranged substantially as shown and described.

7. An electrical water-heater comprising a shell, a bar disposed therein and having spiral water-passages in its periphery, a resistance-coil wound in said water-passages, substantially as shown and described.

8. An electrical water-heater comprising a shell, a bar disposed therein and having spiral water-passages in its periphery, a resistance-coil wound in said water-passages, means for admitting water to one end of said shell and an offtake at the other end of said shell, substantially as shown and described.

9. In an electrical water-heater adapted for heating flowing water, an outer shell, end closures therefor and a supporting-core with-

in the shell having double spiral channels on its periphery to form water-passages, said shell having water-chambers at each end, and a double spirally-wound current-conducting medium wound in said channels, substantially as shown and described.

10. An electric water-heater comprising a shell, a bar or core disposed therein and having double spiral water-passages, a resistance-coil wound in said water-passages, substantially as shown and described.

11. An electric water-heater comprising a shell, a bar or core disposed therein and having spiral water-passages for conveying the water from one end of the shell to the other, a resistance-coil wound in said spiral passages in a double coil with its terminals at one end of the bar, substantially as shown and described.

12. In an electric water-heater for heating flowing water, a double shell or casing having inlet and outlet passages, a longitudinally-perforated supporting member having reverse spiral channels formed therein, a current-conducting medium in said channels, end closures for said shell, one of which is provided with a plurality of perforations for the passage of said conducting medium substantially as shown and described.

13. An electric water-heater comprising an outer shell, a double spirally-channeled core for said shell, a current-conducting medium wound in said channels, from one end of the core to the other and back again to bring the terminals at one end of the core substantially as shown and described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ELI E. SAGER.

Witnesses:
ROWLAND BRITTAIN,
ELLICE WEBBER.