No. 678,314. Patented July 9, 1901.

H. M. HILL.

ELECTRICAL WATER HEATER.

(No Model.) (Application filed July 2, 1900.)

2 Sheets—Sheet 1.

Fig. 1

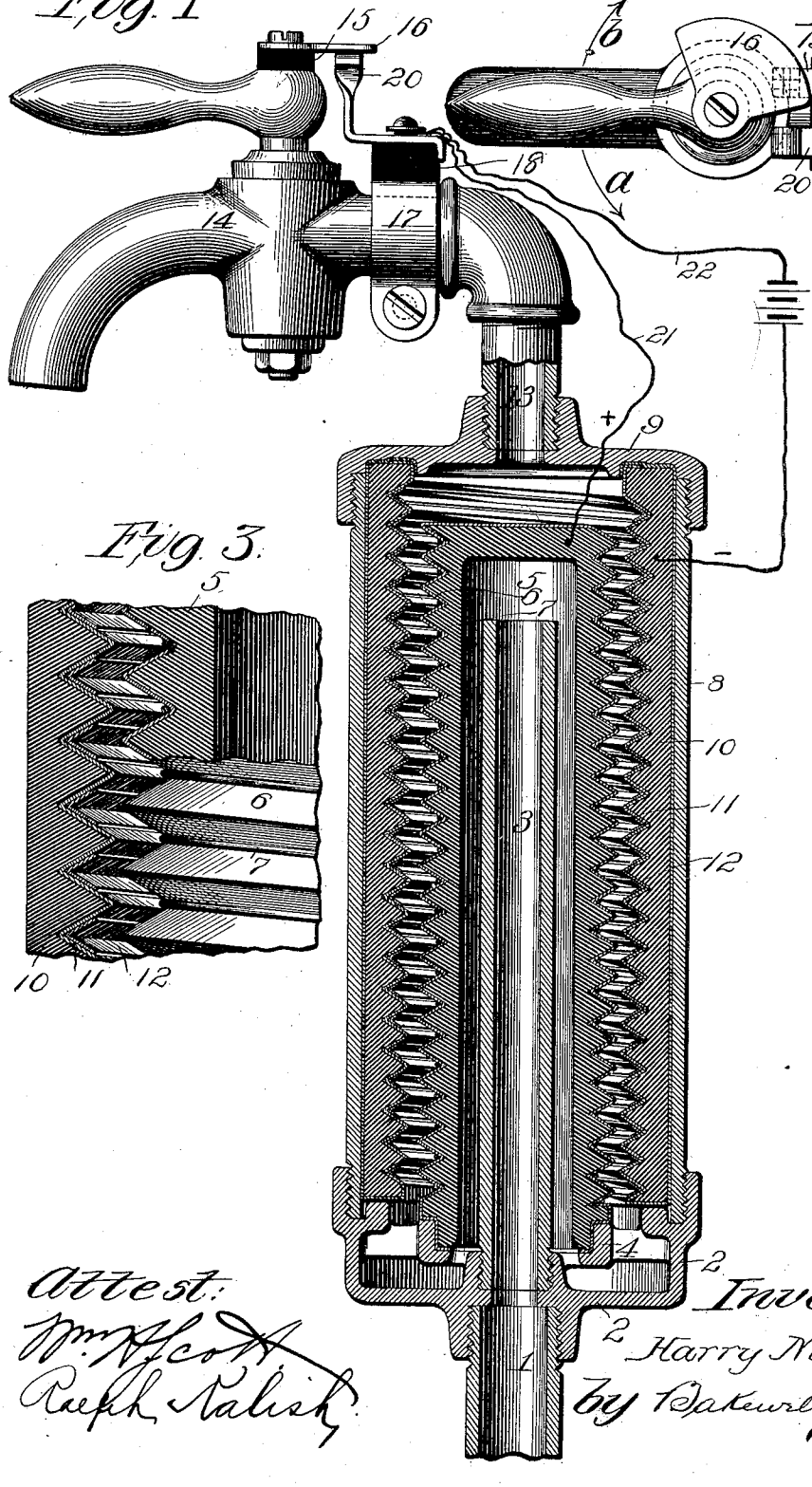


Fig. 2

Fig. 3.

Attest:
Wm. H. Coath
Ralph Talisky.

Inventor:
Harry M. Hill,
by Bakewell & Cornwall
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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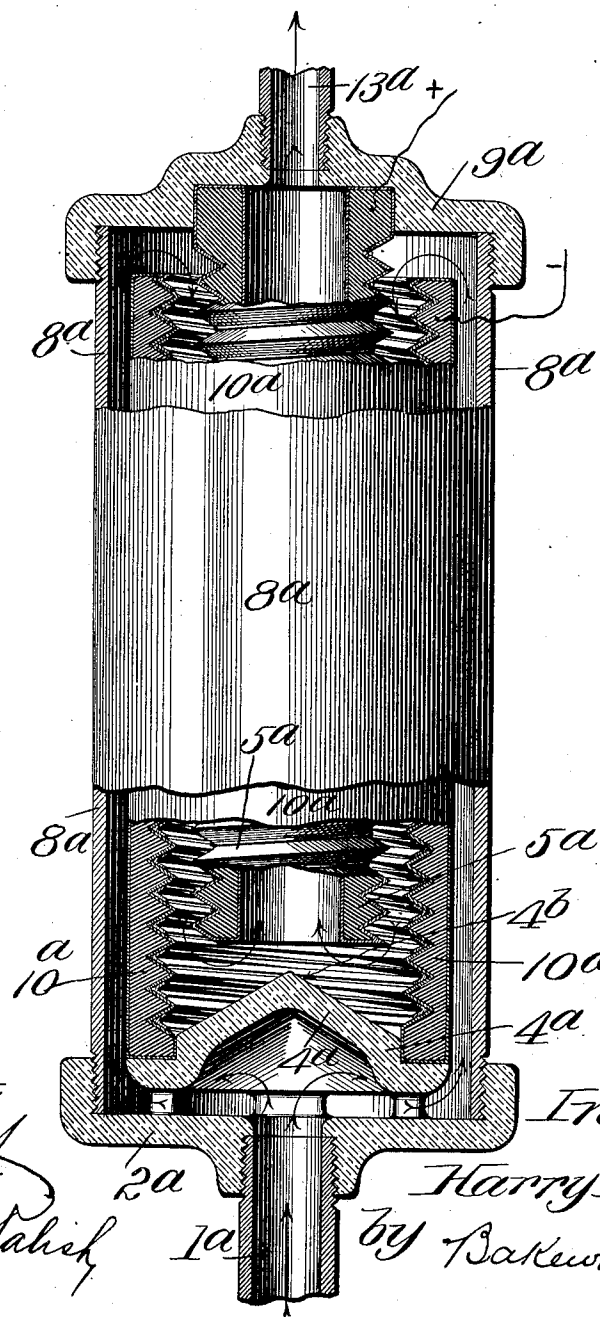
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Fig. 4.



Attest:
Wm. Hoffert.
Ralph Tabich

Inventor:
Harry M. Hill.
by Bakewell & Cornwall
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HARRY M. HILL, OF ST. LOUIS, MISSOURI.

ELECTRICAL WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 678,314, dated July 9, 1901.

Application filed July 2, 1900. Serial No. 22,339. (No model.)

To all whom it may concern:

Be it known that I, HARRY M. HILL, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Electrical Water-Heaters, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view of my improved water-heater. Fig. 2 is a top plan view of the spigot, showing the manner of making and breaking the electric circuit through the heater. Fig. 3 is an enlarged detail view illustrating the zigzag passage for the water being heated, and Fig. 4 is a vertical sectional view of a modified form of heating apparatus.

This invention relates to a new and useful improvement in electrical water-heaters, the object being to provide a device of the character described which is designed to be arranged in the water-pipe and in juxtaposition to a spigot, the manipulation of the handle of said spigot in one direction sending a current of electricity through the heater, so that hot water may be obtained, while turning the handle in the opposite direction will result in cold water issuing from the spigot.

With this object in view the invention consists in the construction, arrangement, and combination of the several parts, all as will hereinafter be described and afterward pointed out in the claims.

In the drawings, 1 indicates the supply-pipe for the water, to which is secured in any suitable manner a casting 2, which casting may be termed the "base" of the heater. This casting is preferably provided with a pipe 3 in communication with the supply-pipe, said pipe 3 extending up into the core of the heater, as shown. A spider-frame in the form of a ring 4, supported by suitable webs or spokes, is arranged in the casting 2 for supporting the core 5 of the heater. This core is provided with a central bore opening into the bottom of the base-casting, while the top thereof is closed. The pipe 3 terminates short of the top of the core, a space being left around said pipe 3, whereby water discharged from pipe 3 will pass downwardly inside the core and into the chamber of the base-casting, whence it passes upwardly between the central core and the hollow cylinder, the heated water escaping through the top of the outer cylinder.

The core 5 and its inclosing hollow cylinder is preferably made of carbon pressed into shape, the two (the inner core and its inclosing cylinder) forming electrodes of an electric circuit.

The periphery of core 5 is preferably formed with spiral grooves in the shape of screw-threads, the faces of said threads being covered by some suitable fabric, (indicated at 6,) which is preferably pressed into shape when the core is being formed, a wire or cord 7 being wound around in the bottom of the grooves to hold the cloth or fabric in its designed position. The object in facing the carbon core or electrode with cloth or fabric is to prevent the disintegrated carbon from passing out through the spigot with the running water, in addition to which the presence of the fabric enables the core being molded much easier, and when molded it will hold its shape better than where the sharp corners of the green carbon are exposed. The wire or cord at the base of the threads holds the fabric in position, and thus assists in preserving the shape of the core. The core shown in the accompanying drawings is formed with a single thread; but it is obvious that a double thread may be formed on its face, and, further, that these threads may be interrupted or the projections shaped as desired. The purpose of these threads, as will presently be seen, is to cause the water passing through the heater to travel in other than a straight path, and this, as will be obvious, can be accomplished in various ways, the formation of the thread, male and female, in the core and encircling cylinder being a convenient and advantageous way of doing this.

8 indicates a cylinder, preferably in the form of a short section of pipe, which is threaded into the base-casting 2 and whose top is closed by a cap 9, threaded thereon. This cylinder 8 carries the encircling electrode 10, which electrode is insulated from its support for well-understood reasons. I will also state here that the core 5 is insulated from its sup-

port where it is desired to use a metallic return-wire; but where the circuit is grounded core 5 may be in electrical connection with the water-supply pipe 1, which is usually grounded. The electrode 10 is preferably formed with spiral grooves in its inner face, said grooves producing substantially a female thread, which, with the male thread on the core 5 when the parts are assembled, forms a zigzag path for the water. The inner face of electrode 10 is covered with fabric 11 for the same purpose as that attributed to the fabric 6 on the core 5; but instead of having a supporting wire or cord in the grooves in electrode 10 I prefer to introduce an angle-support 12, which conforms to the shape of the bottom of the groove.

In the manufacture of electrode 10 a mandrel is preferably employed, which mandrel is grooved, as desired, and on the tops of the threads on the mandrel the supporting-angle 12 is arranged, a roller having a V-shaped groove being employed for this purpose. After the supporting-angle is arranged in position, fabric in the form of a cylinder and of the proper length is introduced over the mandrel and the green or wet carbon placed in position, pressing the fabric in place in the grooves, after which pressure is applied, the mandrel removed, and the electrode dried.

The core 5 preferably terminates short of the cap-piece 9, forming a chamber in the upper end of the heater, from which leads a discharge-pipe 13, said discharge-pipe having a spigot 14 secured thereto. This spigot may be of the usual type, but is preferably so constructed that when the operating-handle is turned in either direction the spigot will be opened to permit the passage of water therethrough. By having such a spigot I am enabled to run cold water through the apparatus when the spigot is turned in one direction, and when the spigot is turned in the opposite direction the circuit is completed and the electrodes energized, whereby the water passing through the apparatus will be heated before it issues from the spigot.

15 indicates an insulation-block secured to the operating-handle of the spigot, which block carries a contact making and breaking plate 16. 17 indicates a clamp secured to the block and carrying an insulation-block 18, upon which are mounted contact points or terminals 19 and 20. From these terminals wires 21 and 22 lead to the core 5 and electrode 10, respectively.

Referring to Fig. 2, it will be seen that when the operating-handle of the spigot is turned in the direction of the arrow A the electric circuit will not be completed and the water passing through the apparatus will not be heated. However, when the operating-handle is turned in the direction of the arrow B plate 16 electrically connects the terminals 19 and 20 and establishes the circuit through the heater, so that the water passing therethrough will be heated.

From the above it will be seen that water from pipe 1 will pass through pipe 3 and contact with the core 5 at or near its top. If the current is on, this core will be heated to some extent, and as the entering water passes downwardly throughout the length of the core it will become heated to some degree, this initial heating of the water being advantageous and not interfering with the operation of the apparatus in any way. As the water leaves the chamber in the core 5 it passes through the base-casting and thence travels upwardly in a zigzag path between the electrodes 5 and 10. As an electric current, say, of one hundred and ten volts will destroy all animal and vegetable matter in water to a large extent the zigzag path which the water being treated is compelled to travel is advantageous in that it tends to precipitate any foreign matter in the water in the grooves of either the core 5 or the encircling electrode 10. This precipitation is due to the formation of eddies in the bases of the grooves, which eddies retain the precipitated matter and prevent its escape through the spigot. The water passing upwardly through the zigzag path formed by the threads will also be given a whirling motion, so that when it reaches the chamber in the top of the heater centrifugal action will assist in ridding the water of such foreign particles which are affected thereby. The discharge-pipe 13 is therefore led from the center of this chamber, and in area this pipe is considerably less than the inlet-pipe 1. I prefer to have the discharge-pipe smaller, for the reason that the water is not only under pressure in the apparatus, but is compelled to move slowly. In fact, depending upon the size of the apparatus, the water can be held therein so long as to be treated almost in a static condition. I prefer, however, that the water be in motion while being treated in order that it may be deprived as far as possible of its impurities.

In Fig. 4 I have shown a modified form of heating apparatus wherein the water or other liquid to be heated entirely surrounds the electrodes. In this construction 1^a indicates the inlet-pipe, and 2^a the base-casting, which supports a solid spider-frame 4^a, preferably having a conical extension 4^b on its upper face. The inner core 5^a is in the form of an open-ended cylinder and is suspended from the cap-piece 9^a, from which leads the discharge-pipe 13^a. The electrode 10^a is supported by the frame 4^a, as shown, while the casing 8^a provides a space around the electrode 10^a for the passage of the water. These various parts are preferably concentrically arranged, and the electrodes are provided with the spiral grooves or channels, as before described.

In operation the water entering through the inlet-pipe passes upwardly between the outer inclosing shell and the electrode 10^a, this water absorbing the heat from said electrode, and thus preventing direct radiation

of heat therefrom to the exterior. The water then passes downwardly between the electrodes, being given a spiral or whirling motion, so that centrifugal action tends to relieve it of foreign particles susceptible of such action, the pitch of the thread tending to carry said foreign particles down to the bottom. The conical projection 4^b serves to prevent foreign particles being drawn up through the electrode 5^a. The water thus being relieved of its foreign particles passes upwardly through the central core in substantially a clarified state.

I do not in this application claim the electrodes shown and described, as the same form the subject-matter of a divisional application filed by me on or about October 25, 1900, serially numbered 34,298.

I am aware that minor changes in the arrangement, construction, and combination of the several parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electric heater, the combination with an inclosing shell, of heads arranged at each end thereof, inlet and discharge pipes connected to said heads, and electrodes arranged within the casing, a space being provided between said electrodes for the passage of the water; substantially as described.

2. In an electric heater, the combination with an inclosing shell, of heads arranged thereon, inlet and discharge pipes connected to said heads, and electrodes mounted in the opposite heads respectively, one of said electrodes being in the form of a hollow cylinder, and the other of said electrodes being in the form of a core fitting within said cylinder and providing a space between its periphery and the inner wall of said cylinder for the passage of liquid; substantially as described.

3. In an electric heater, the combination with an inclosing shell, of heads arranged thereon, and concentric electrodes suitably spaced apart and arranged within said shell, whereby the water to be heated passes vertically along the inner and outer faces of one of said electrodes; substantially as described.

4. In an electric heater, the combination with a suitable casing, of a cylindrical electrode, and an electrode in the form of a core introduced within the cylindrical electrode so as to form a space for the passage of water between said electrode; the inclosed electrode being wholly submerged in the liquid being heated; substantially as described.

5. In an electric heater, the combination with an inclosing shell, of a base-casting carrying a spider-frame, an electrode supported by said frame, an inlet-pipe connected to said base-casting, a cap arranged upon the upper end of the inclosing shell, and a discharge-pipe connected to said cap; substantially as described.

6. In an electric heater, the combination with two electrodes arranged in juxtaposition to each other, one of said electrodes being in the form of a hollow cylinder, and the other of said electrodes being in the form of a core arranged within the hollow cylindrical electrode, and means on the contiguous faces of said electrodes for causing the liquid passing between them to travel other than a straight path; substantially as described.

7. In an electric heater, the combination with two electrodes arranged in juxtaposition to each other, so as to provide a space for the passage of liquid between them, and recesses or pockets formed in the contiguous faces of said electrodes for developing eddies in the passing liquid for arresting foreign matter; substantially as described.

8. An electric heater having electrodes arranged in juxtaposition to each other for providing a space for the passage of liquid between them, the contiguous faces of said electrodes being grooved to form a zigzag path for the liquid; substantially as described.

9. In an electric heater, the combination with two concentrically-arranged electrodes, and means on the contiguous faces of said electrodes for imparting a circular motion to the passing liquid; substantially as described.

10. In an electric heater, the combination with two concentrically-arranged electrodes, the contiguous faces thereof being formed with spiral grooves, said grooves being staggered to provide a circular zigzag path for the passing liquid; substantially as described.

11. In an electric heater, the combination with an inclosing casing, of concentrically-arranged electrodes therein, the contiguous faces of said electrodes being provided with means for imparting a circular motion to the liquid passing between them, and chambers for collecting the foreign matter precipitated; substantially as described.

12. In an electric heater, the combination with an inclosing shell, of a base-casting provided with a spider-frame having a conical upper face, an electrode 10^a spaced from said inclosing shell to provide a passage for the water, said electrode being mounted upon said spider-frame, an inlet-pipe leading into said base-casting, a cap-piece arranged upon the upper end of the inclosing shell, a hollow electrode in the form of a core 5^a suspended from said cap-piece within the first-mentioned electrode, and a discharge-pipe leading from the upper end of the hollow core electrode; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 28th day of June, 1900.

HARRY M. HILL.

Witnesses:
WM. H. SCOTT,
A. S. GRAY.