F. W. MOFFAT.

ELECTRIC WATER HEATER.

APPLICATION FILED FEB. 13, 1919.

1,320,890.

Patented Nov. 4, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

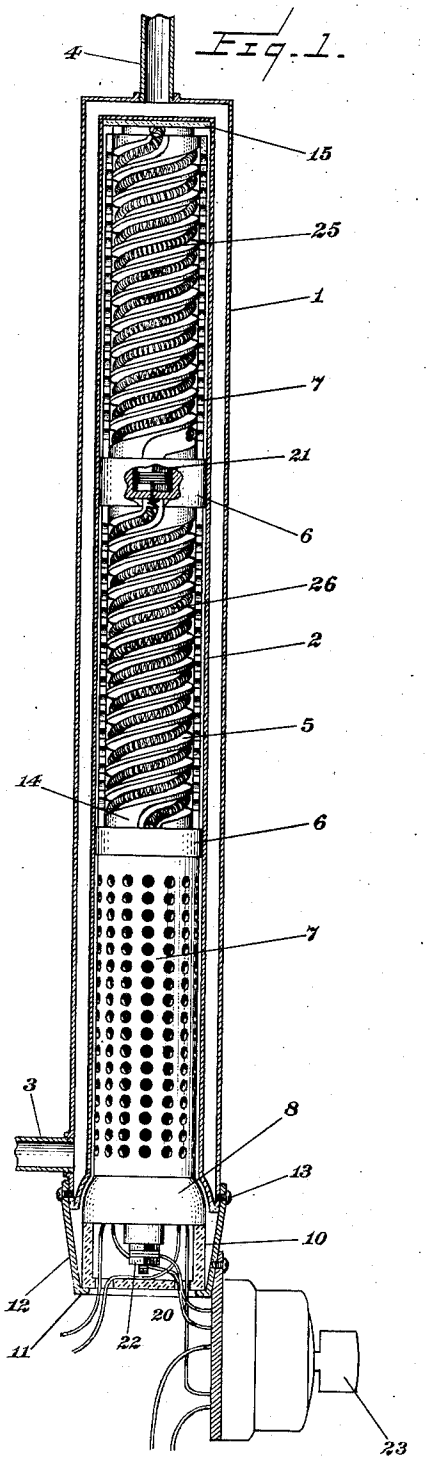
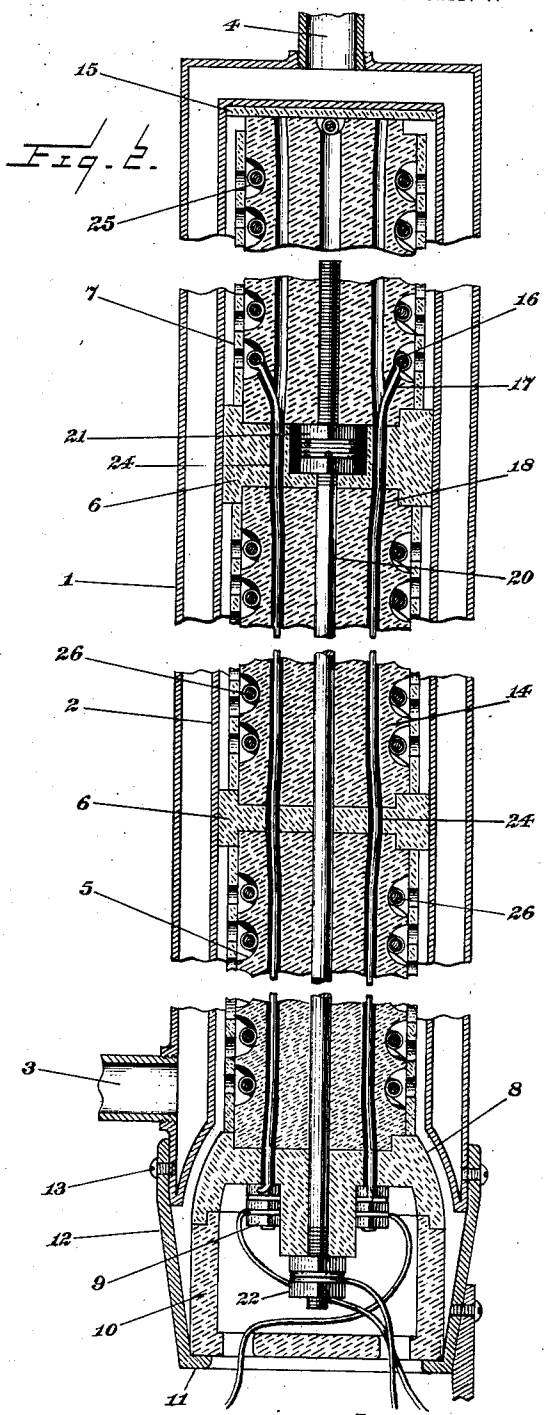


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

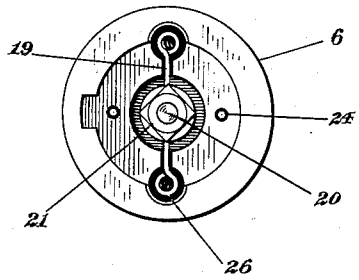


Fig. 5.

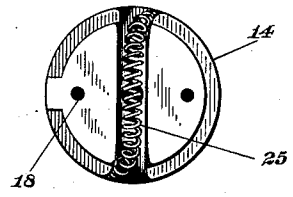


Fig. 6.

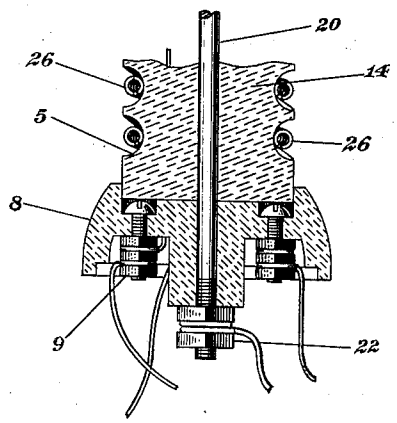


Fig. 4.

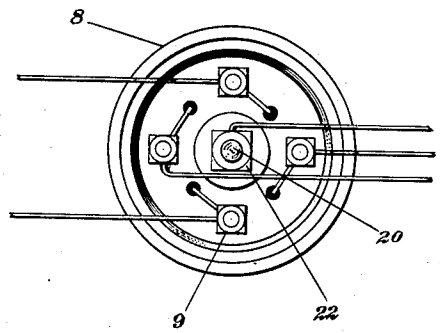
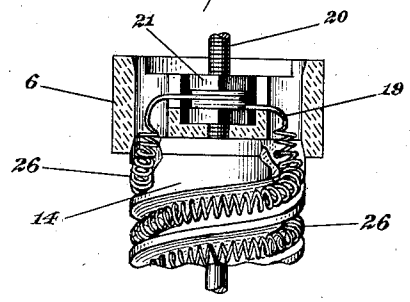


Fig. 7.



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UNITED STATES PATENT OFFICE.

FREDERICK W. MOFFAT, OF WESTON, ONTARIO, CANADA.

ELECTRIC WATER-HEATER.

1,320,890. Specification of Letters Patent. Patented Nov. 4, 1919.

Application filed February 13, 1919. Serial No. 276,812.

To all whom it may concern:

Be it known that I, FREDERICK W. MOFFAT, a subject of the King of Great Britain, and resident of the town of Weston, in the county of York, Province of Ontario, Canada, have invented certain new and useful Improvements in Electric Water-Heaters, of which the following is a specification.

This invention relates to apparatus particularly adapted for the heating of water in large quantities for household or other purposes, and my object is to devise apparatus in which a great range of heat effects is obtainable and in which the heating element can be given any desired capacity by a simple duplication of parts used in the elements of the smallest capacity.

I attain my object by means of the constructions hereinafter specifically described and illustrated in the accompanying drawings in which—

Figure 1 is an elevation, partly in section and partly broken away, of the heater;

Fig. 2 a longitudinal section partly broken away and on a larger scale;

Fig. 3 a plan view of the spacer employed at the end of the second section from the bottom of the heater;

Fig. 4 a plan view of the under side of the lower end piece carrying the terminals;

Fig. 5 a plan view of the outer end of the support section remote from the terminals;

Fig. 6 a cross section through the end piece shown in Fig. 4 illustrating more particularly the connection of the terminals; and

Fig. 7 a cross section through the spacer shown in Fig. 3 showing particularly the connection of the resistance windings to the central conductor.

In the drawings like numerals of reference indicate corresponding parts in the different figures.

The heater comprises two main parts, a water jacket and an electric heating element inserted therein within the inner shell of the water jacket. The water jacket comprises the outer shell 1 and the inner shell 2. With the water jacket communicates the inlet pipe 3 and the outlet pipe 4. The shells are connected together at their lower ends so that the inner shell is open at its lower end for the insertion of the heating element. This heating element includes a cylindrical resistance wire support of refractory insulating material adapted to be inserted within the inner shell 2 and carrying suitable resistance windings. This support has spiral grooves 5 formed therein in which the resistance is wound and is provided with collars 6 which space the cylindrical support from the inner shell and form shoulders against which the sections 7 of a cylindrical protecting shell of refractory insulating material abut. These shell sections 7 are a protection against shorts should the heating coil break, are perforated to permit of the radiation of heat from the resistance to the shell 2 and are of such a thickness that the collars 6 only contact with the inner shell. This permits of the easy insertion of the heating element within the shell 2.

The lower end of the cylindrical support rests on and is set into the upper side of an end piece 8 of refractory insulating material, in which are secured bolts 9 forming electric terminals. In the constructions shown in Figs. 1 and 2, this end piece rests on the hollow base 10 of refractory insulating material, which is supported on a shoulder 11 on a depending metal ring 12 secured by means of screws 13 to the lower end of the shell 1. Suitable holes are provided in this base for the passage of the wires leading to the terminals 9.

In the preferred construction, the cylindrical support is formed of a plurality of support sections 14, the collars or spacers 6 being fitted between the sections, and being also preferably recessed to receive the ends of these sections so as to prevent relative lateral displacement of the sections. By adopting such a sectional construction, I am enabled to make the complete element of any desired length simply by adding new sections and using such further collars or spacers as may be necessary. In the drawings I show three such sections, but it will be understood, of course, that more or less may be employed.

Between the upper end section and the end of the shell 2 I place a sheet 15 of insulating material to prevent contact of the resistance wire with the end of the shell. In the preferred form of my device one of the support sections may be provided with a resistance winding entirely independent of the resistance winding on the rest of the support sections.

Preferably the arrangement is as shown in the drawings, this independent winding being located on the upper supporting sec-

tion. It will be seen on reference to Figs. 1 and 5 that a double spiral groove is formed in the periphery of the end section of the support, as also in the other sections, and at the outer end of the section is formed a transverse groove connecting the spiral grooves. A single winding of coiled wire is wound in these grooves crossing from one to another in the transverse groove. The connecting wires 16 for this winding are led through the holes 17 to holes 18 extending longitudinally of the support sections and holes 24 through the collars or spacers 6. Through these holes 18 and 24 the connecting wires pass to two of the terminals 9, which terminals will be connected independently to a suitable source of electric energy.

The winding for the other two sections is preferably arranged to give a three heat effect, that is, two independent windings 26 are employed, each connected at its lower end to a suitable terminal 9. These windings at their upper end are connected by means of the connecting wires 19 to a conductor 20 formed as a rod fitted in a hole extending longitudinally of the support sections 14. At its upper end this rod has suitable nuts 21 threaded thereon adapted to clamp the ends of the conductors 20. This conductor extends, of course, through suitable holes in the collars or spacers 6 and the end piece 8 and at its lower end is provided with the nuts 22 so that it forms a terminal for the third wire from the switch 23 which will be of the usual three heat type and suitably connected with the source of energy.

When the device is set up as shown, the usual mode of operation will be as follows. Current will constantly flow through the independent winding at the upper end section of the resistance wire support so that a certain amount of heat is constantly supplied to the water passing through the jacket. If hotter water or more rapid heating is desired, the switch 23 is operated to connect the resistance to give either low, medium or high heating effect according as the current is allowed to pass through one winding only, or through both in series or in parallel. This arrangement, of course, is well known in the art.

What I claim as my invention is:—

1. In an electric heating element, the combination of a plurality of cylindrical resistance wire support sections of insulating material fitted end to end; resistance wire carried thereby; suitably supported end terminals to which the resistance wire is connected, the connections extending through passages in the body of the support and a cylindrical protecting shell of insulating material for each section.

2. In an electric heating element the combination of a cylindrical resistance wire support spirally grooved to receive resistance windings; two resistance windings wound on the support occupying different positions longitudinally of the support; separate conductors for the two resistance windings, the support being provided with internal longitudinal passages for said conductors; and separate terminals at one end of the support for the conductors of the separate windings.

3. In an electric heating element the combination of a plurality of cylindrical resistance wire support sections of insulating material fitted end to end; resistance wire carried thereby; a coupling member of insulating material fitted between adjacent support sections, holes being formed in said spacing member for the passage of the electric connections from one support section to the other; and a cylindrical protecting shell of insulating material for each support section, the spacing members being greater in diameter than the sections to form shoulders against which the ends of the shells abut.

4. In an electric heating element, the combination of a cylindrical resistance wire support of insulating material spirally grooved to receive resistance windings; a central metal connector extending longitudinally through the support; two resistance windings wound on the support; terminals for said windings at one end of the support, the windings at their ends remote from the terminals being connected to said central conductor.

5. In an electric heating element, the combination of a cylindrical resistance wire support of insulating material spirally grooved to receive resistance windings; a central metal connector extending longitudinally through the support; two resistance windings wound on the support part way from one end; terminals for said windings at said end of the support, the windings at their ends remote from the terminals being connected to said central conductor; and an independent resistance winding on the part of the support remote from the terminals, the part of the support carrying the two windings being provided with two longitudinal holes through which pass connections for said independent winding.

6. In an electric heating element, the combination of a cylindrical resistance wire support of insulating material spirally grooved to receive resistance windings; a plurality of spaced collars of greater diameter than the body of the element at different parts of the length of the support; and a cylindrical protecting shell formed in sections abutting said collars.

7. In an electric heating element the combination of a cylindrical resistance wire support having a double spiral groove formed in its periphery, the ends of the

grooves at one end of the support being connected by a transverse groove; and a single winding of resistance wire wound in the spiral grooves and crossing from one to the other in the transverse groove.

8. In an electric heating element the combination of a cylindrical resistance wire support having a double spiral groove formed in its periphery, the ends of the grooves at one end of the support being connected by a transverse groove; a single winding of resistance wire wound in the spiral grooves and crossing from one to the other in the transverse groove; and holes extending from the other ends of the grooves through the end of the support.

Signed at Toronto, Canada, this 21st day of Jan., 1919.

FREDERICK W. MOFFAT.