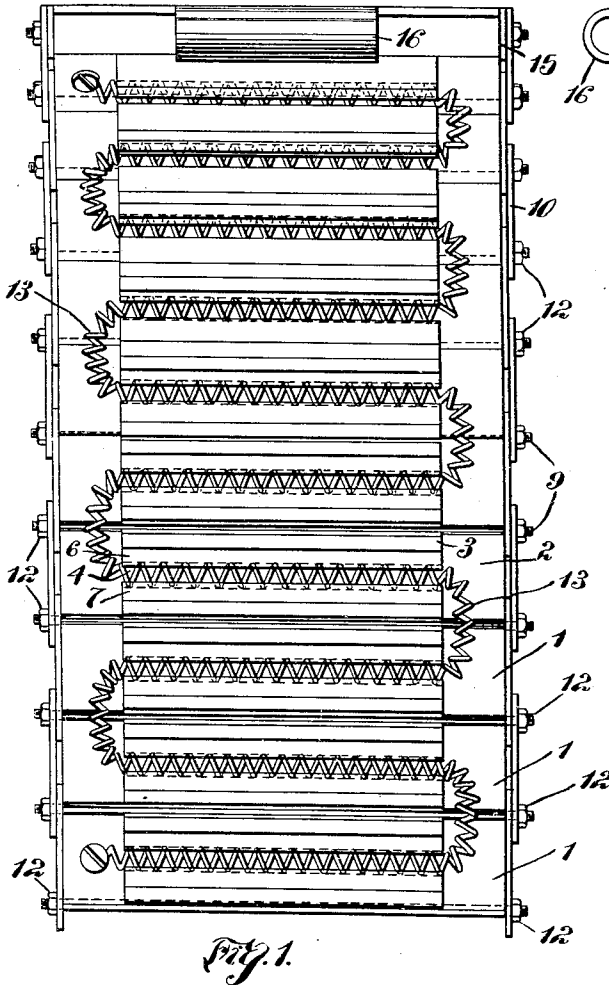
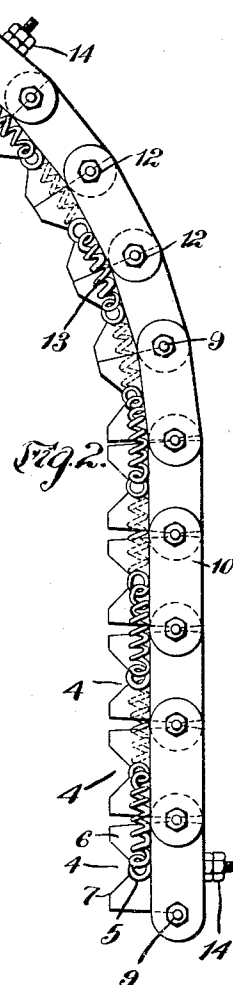
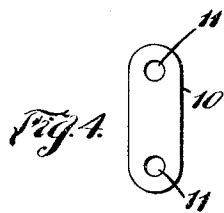
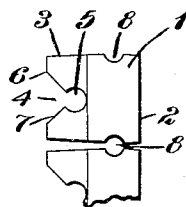


F. F. FORSHEE.
FLEXIBLE WATER HEATER.
APPLICATION FILED JUNE 17, 1920.

1,406,360.

Patented Feb. 14, 1922.

2 SHEETS—SHEET 1.



WITNESSES:

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Frank F. Forshee.

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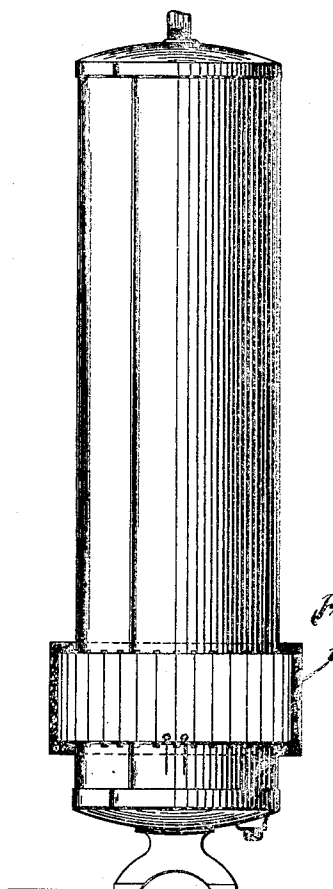
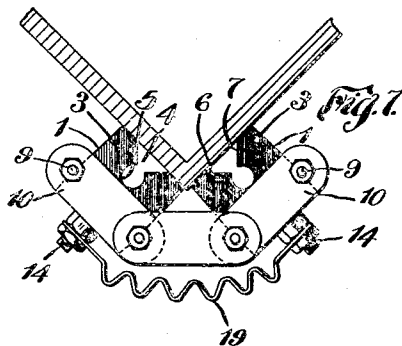
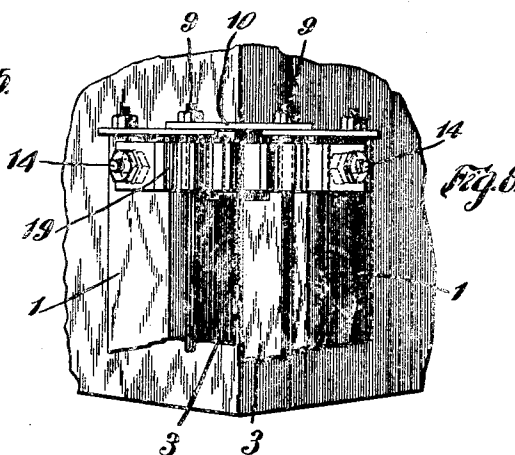
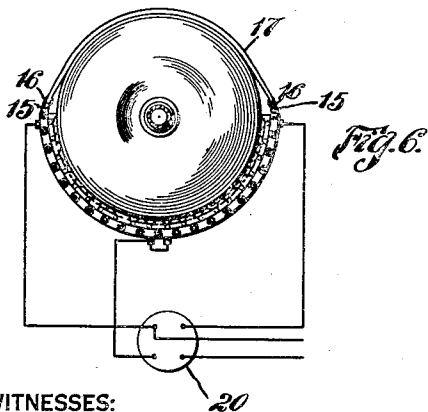
ATTORNEY

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2 SHEETS—SHEET 2.



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FLEXIBLE WATER HEATER.

1,406,360.

Specification of Letters Patent. Patented Feb. 14, 1922.

Application filed June 17, 1920. Serial No. 389,610.

To all whom it may concern:

Be it known that I, FRANK F. FORSHEE, a citizen of the United States, and a resident of Flint, in the county of Genesee and State of Michigan, have invented a new and useful Improvement in Flexible Water Heaters, of which the following is a specification.

My invention relates to electrically-heated apparatus and particularly to fluid heaters, and it has, for one of its objects, to provide a refractory resistor-supporting means which may be easily molded and shall embody means for so supporting the resistor that a relatively large proportion of the heat may be radiated directly against the surface of the fluid container.

Another object of my invention is to provide an articulated fluid heater which may be mounted in heat-radiating relation on the surface of a fluid container.

Another object of my invention is to provide improved means for holding a heater of the character above designated in any desired location upon a fluid container.

More specifically, my invention embodies a plurality of refractory parallel-extending supporting members substantially rectangular in cross-section, each member having a longitudinally-extending slot, substantially triangular in cross-section, in one face thereof and a resistor-supporting chamber, substantially circular in cross-section, below said slot and connected thereto.

A substantially semi-cylindrical longitudinally-extending groove is provided in each of the lateral faces of the supporting members for co-operation with a rod and metal-link members to hold a number of supporting members in side-by-side spaced relation.

The lateral faces of each refractory member are bevelled away from the groove to slightly reduce the width at the inner and outer faces to permit the refractory members to have a small turning movement relative to each other and thus permit an assembled group of supporting members to conform to the contour of the surface of a container upon which the heater may be mounted. Means are provided to permit of secur-

ing the assembled group of supporting members in place against the surface of the fluid container.

Referring to the two sheets of drawings, Figure 1 is a view in front elevation and

Fig. 2 is a top plan view of a device embodying my invention;

Fig. 3 is a top plan view of one of the refractory supporting members and

Fig. 4 is a top plan view of one of the link members.

Fig. 5 is a view, in side elevation, of a device embodying my invention as mounted on an ordinary water tank;

Fig. 6 is a view, in plan, of the apparatus shown in Fig. 5;

Fig. 7 is a view, in plan, of several supporting members mounted on a container of rectangular contour and

Fig. 8 is a view, in side elevation, of the device shown in Fig. 7.

Referring particularly to Figs. 1 and 2, the device comprises a plurality of refractory supporting members 1 substantially square in cross-section and located in side-by-side relation by means to be hereinafter set forth.

Each of the supporting members 1 comprises an outer part 2 and an integral inner part 3, the part 3 being somewhat shorter than the part 2. The inner face of the member 1 is provided with a substantially triangular longitudinally-extending groove 4, and a resistor-supporting chamber 5 is located in the part 2 below the groove 4 and in connection therewith.

The chamber 5 is substantially cylindrical, and the side walls 6 and 7 of the groove 4 are substantially radial to the center of the chamber 5 and are so located as to make an angle of 90° with each other. This construction results in the width of the groove 4 at the bottom thereof being less than the diameter of the chamber 5.

A longitudinally-extending, substantially semi-cylindrical groove 8 is provided in each of the lateral faces of the part 2 and located at substantially the middle of the width of each face.

The lateral faces of the member 1 are not equidistant throughout the thickness thereof but slope toward each other at the outer and the inner faces of the member 1, as shown in Fig. 3.

Any desired number of refractory supporting members 1 may be assembled in parallel-spaced relation by laying them upon a plane surface substantially in the position shown in Fig. 1. The semi-cylindrical grooves 8 in two adjacent members 1 will then form a substantially cylindrical groove in which is placed a metal rod 9 which is slightly longer than the members 1 and is provided with threaded ends.

Link members 10, each of which is provided with two substantially circular openings 11 near the ends thereof, may then be placed so that the openings 11 will fit around the rods 9, and the link members 10 are arranged to overlap, as shown in Fig. 1. The distance between the openings 11 in the link members 10 is substantially equal to the distance between the centers of the semi-cylindrical grooves 8 in the members 1.

After the link members 10 have been placed over the rods 9 at each end of the members 1, nuts 12 may be placed upon the threaded ends of the rods 9 to hold the link members in place. If desired, the ends of the rods 9 may be flattened very slightly to preclude the nuts 12 working off the ends of the rods.

The group of supporting members 1, together with the rods and link members assembled, as described above, may now be handled as a unit and it will be noted that each member 1 now has a limited turning movement relative to the adjacent members 1 on each side thereof, thus providing, in effect, an articulated resistor-supporting means comprising a number of relatively small refractory members.

The heating element comprises a helically-wound resistor 13, the outside diameter of the heating element being somewhat smaller than the diameter of the resistor-supporting chamber 5.

To mount the resistor in the supporting members, it is only necessary to thread the helix through the chamber 5 from one supporting member to the adjacent one until the entire length of the resistor has been placed in the resistor-supporting chambers 5 and therebetween at the ends of the part 3 between adjacent members 1.

Each of the end supporting members 1 of a group may be provided with a terminal member 14 to the inside end of which the respective ends of the heating element 13 may be suitably connected.

A metal member 15 may be suitably secured to the end rods 9 and be provided with a hook-shaped extension 16. A band member 17, (see Fig. 6) may be used in co-opera-

tion with the hooks 16 to hold the completed heater against the surface of a fluid container, as shown in plan view in Fig. 6.

A heat-insulating covering 18 may be applied over the outside and the ends of the complete heater in order to cut down the radiation of heat away from the heater.

The slope of the lateral faces of the supporting members 1, as shown in Fig. 3, is sufficient to permit of mounting a group of such members upon a cylindrical container of approximately 8 inches in diameter and, as these faces are sloping towards both the inner and the outer faces of the members 1, such group may be mounted either on the external convex surface of a container or it may be mounted upon the inner surface of an annular fluid container.

My invention may be utilized in connection with a container having substantially rectangular corners, as shown in Fig. 7. In this case, the supporting members 1 used adjacent the corners are the ones which are provided with terminal members 14, and a suitable flexible connecting lead 19 may be employed to conduct the current from one terminal member to the other. It may be noted that one of the supporting members 1 has been omitted but that the link members 10 may be used at the corner exactly as though the supporting member 1 had not been omitted.

If desired, the resistor 13 may be divided into substantially equal parts, and a standard control switch 20 may be used to permit the separate parts to be connected in series or in parallel.

It may be noted that the device embodying my invention provides an articulated resistor-supporting means made up of a number of molded refractory members and that this device permits of mounting the complete heating element upon a container having either a circular or a rectangular contour or even of irregular contour.

The arrangement of groove 4 and chamber 5 in the part 3 of each of the supporting members 1 permits of holding the resistor 13 at a relatively small distance from the surface of the fluid container and also insures that the resistor will be held firmly and prevented from coming in contact with the container which might result in a short-circuit or a grounded circuit.

As it is the intention to operate the resistor at a relatively high temperature, most of the heat will be transmitted to the fluid container by radiation and the relative proportions of the chamber 5 and the groove 4 have been selected with a view to permitting as large a portion of the surface of the resistor 13 to radiate its heat directly against the container as is possible. I am aware a number of devices have been patented which show a resistor-supporting chamber

somewhat similar to the one shown and described in this application but in none of these is there a possibility of as great a direct radiation of heat as in the one I have shown and described.

While I have shown a specific embodiment of my invention, I desire that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

I claim as my invention:

1. An electric heater comprising a plurality of refractory supporting members, each member having a resistor chamber in one face thereof, a resistor wire located in said chamber, and means for holding said supporting members in parallel-spaced relation.

2. An electric heater comprising a plurality of refractory supporting members each member having a resistor chamber in one face thereof, a resistor located in said chamber and means for holding said supporting members in parallel-spaced relation, said holding means permitting a slight turning movement of said members relative to each other.

3. An electric heater comprising a plurality of elongated refractory members each having a longitudinally-extending resistor chamber in one face thereof, a continuous resistor wire located in said resistor chambers and extending therebetween at alternate ends of said members, terminal members mounted on two of said refractory members and means for holding said refractory members in parallel-spaced relation.

4. An electric heater comprising a plurality of elongated refractory resistor-supporting members, each member having a substantially rectangular cross-section and having a longitudinally-extending resistor chamber of lesser length than said member in one face thereof, a continuous resistor wire located in said chambers, means for holding said supporting members in parallel-spaced relation, and terminal members mounted upon two of said refractory members.

5. An electric heater comprising a heating element, a plurality of refractory supporting members for said heating element assembled in parallel-spaced relation, and means for holding said supporting members in said relation and for permitting them to have a limited movement with relation to each other.

6. An electric heater comprising a continuous heating element, a plurality of refractory supporting members for said heating member of substantially rectangular cross-section and located in parallel-spaced relation, each of said supporting members having a longitudinally-extending chamber in which the heating element is located and an open slot communicating with said cham-

ber and narrower at its bottom than said chamber and having widely diverging sides, and means for holding said supporting members in said parallel-spaced relation and for permitting them to have a limited movement with relation to each other.

7. A flexible electric heater comprising a plurality of refractory parallel-extending members of substantially rectangular cross-section, each member having an embodying resistor-supporting chamber of lesser length than said member on its inner face, a continuous resistor located in said chambers and means for holding said refractory members in operative relation to each other, said holding means permitting said members to have a limited movement with relation to each other.

8. In an electric heater, the combination with a plurality of elongated refractory supporting members of substantially rectangular cross-section, each member having a longitudinal groove in each of two opposite faces and a resistor-supporting groove in another of its faces, a continuous heating element located in said resistor-supporting groove, rods operatively engaging said longitudinal grooves and links engaging said rods, said rods and links co-operating to hold said supporting members in spaced relation and to permit them to have a limited movement with relation to each other.

9. An electric heater comprising a plurality of refractory supporting members each member having a resistor-supporting chamber in its inner face, a continuous resistor wire-located in said chambers, means for holding said supporting members in spaced relation and for permitting them to have a limited movement with relation to each other, and means for holding said set of supporting members against the surface of a container.

10. An articulated electric heater comprising a plurality of elongated refractory supporting members substantially rectangular in cross-section, each member having a longitudinally-extending resistor chamber in the inner face and a longitudinally-extending groove in each of the lateral faces, a continuous resistor wire located in said resistor chambers, rods located in the grooves of adjacent supporting members and extending beyond the ends thereof, overlapping links secured to the ends of said rods, said rods and links holding said supporting members in longitudinal and in lateral spaced relation and permitting them to have a limited turning movement on said rods with relation to each other and means for holding said set of supporting members against the surface of a container.

11. An electric heater comprising a continuous resistor, a plurality of refractory supporting members for said resistor of

substantially rectangular cross-section, each of said supporting members having a longitudinally - extending resistor - supporting chamber in one face thereof and an open slot communicating with said chamber and narrower at its bottom than said chamber and having sides which are located at an angle of substantially 90° with each other, and means for holding said supporting members in parallel-spaced relation and for permitting them to have a limited turning movement with relation to each other.

12. An electric heater comprising a continuous resistor, a plurality of refractory supporting members for said resistor of substantially rectangular cross-section, each of said supporting members having a longitudinally - extending resistor - supporting chamber substantially circular in cross-section in one face thereof and an open slot communicating with said chamber and narrower at its bottom than said chamber and having side walls which are substantially radial to the center of said chamber and at an angle of 90° to each other, means for holding said supporting members in parallel-spaced relation and for permitting them to have a limited turning movement relative to each other and means for holding said set of supporting members against the surface of a container.

13. An electric heater comprising a re-

sistor, a plurality of refractory resistor-supporting members, said members having a limited turning movement relative to each other, and means for holding said members in longitudinal parallel-spaced relation and for permitting said members to conform to the contour of the surface of a container.

14. In an electrical fluid-heater, the combination with a container for said fluid, of a resistor, a plurality of parallel-extending refractory resistor-supporting members having a limited turning movement relative to each other, means for holding said members in parallel-spaced relation and for permitting them to be mounted on and to conform to the contour of the surface of said fluid container.

15. An electrically-heated apparatus comprising a continuous resistor and a plurality of articulated insulating refractory supporting members.

16. An electric water heater comprising a continuous resistor, a plurality of articulated insulating refractory supporting members and means for holding said supporting members against the surface of a container the contents of which are to be heated.

In testimony whereof, I have hereunto subscribed my name this 8th day of June, 1920.

FRANK F. FORSHEE.