May 19, 1925. 1,537,987

V. F. DECKERT

WATER HEATER

Filed Aug. 1, 1921

Fig. 1.

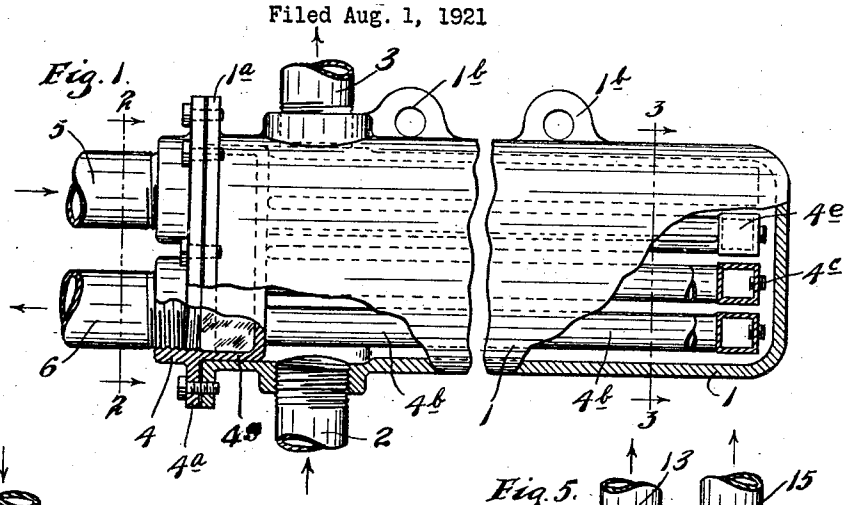


Fig. 2.

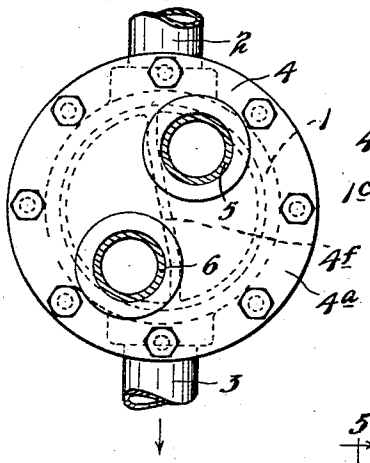


Fig. 3.

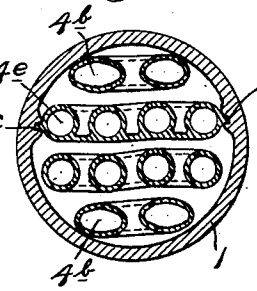


Fig. 5.

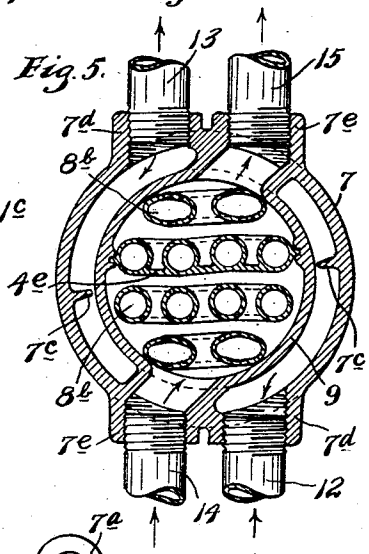
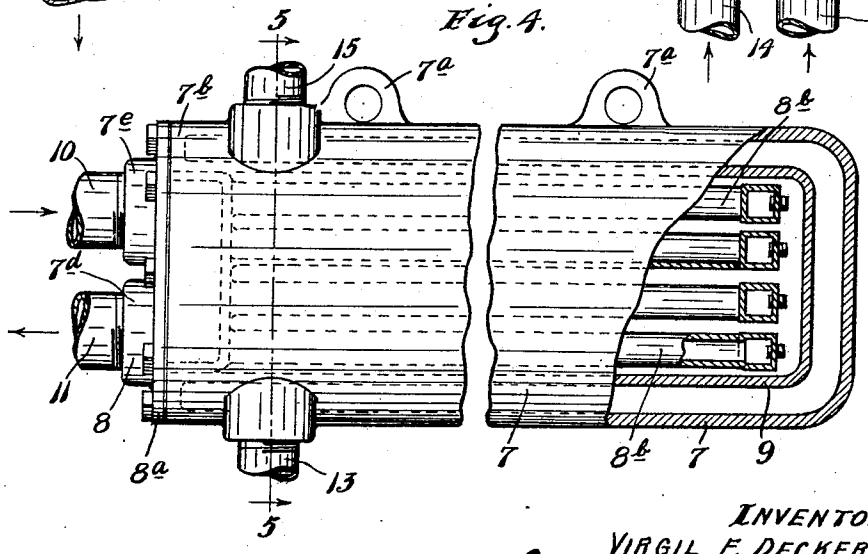


Fig. 4.



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UNITED STATES PATENT OFFICE.

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WATER HEATER.

Application filed August 1, 1921. Serial No. 488,845.

To all whom it may concern:

Be it known that I, VIRGIL F. DECKERT, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Water Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a water heater and particularly to the type adapted to be positioned in the circulatory system of ordinary heating apparatus for heating buildings, such as hot water heating plants or steam heating plants.

The water heater disclosed and claimed herein is an improvement upon that disclosed and claimed in Patent No. 1,290,112, granted to me January 7th, 1919.

It is an object of this invention to provide such a heater comprising but two main parts which can be assembled with but one water-tight joint, thus assuring tightness and simplicity of packing.

It is another object of the invention to provide such a device containing a multiplicity of passages through which the water to be heated is caused to flow; which passages have a large external surface exposed to an extended flow of the heating medium, such as steam or hot water.

Other objects and advantages of the invention will more fully appear in the following description made in connection with the accompanying drawings in which like reference characters refer to the same parts throughout the different views, and in which—

Fig. 1 is a view in side elevation of one form of the heater, certain parts thereof being shown in section;

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1, as indicated by the arrows;

Fig. 4 is a view in side elevation with parts broken away of a modified form of the device; and

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 4.

Referring to the drawings, especially to Figs. 1 and 3, the device comprises a cylindrical or other suitably shaped shell 1 having an open and a closed end and provided at its open end with an external flange 1^a. Spaced apertured lugs 1^b project from the top of the shell 1 by which it may be hung or bolted to suitable supports. The shell is provided near its open end with oppositely and transversely projecting bosses having end openings therethrough, which connect the inlet pipe 2 and the outlet pipe 3 for the fluid heated. The shell 1 is adapted to receive at its open end a base or core member 4 formed at one end as a cylindrical head having therein a cylindrical chamber and carrying a circumferential flange 4^a shown as of the same diameter as the flange 1^a to which it is adapted to be bolted by suitable circumferentially spaced bolts, a suitable water-tight packing being inserted between the flanges. The flange 4^a is provided with spaced cylindrical bosses having threaded openings therethrough into which are fitted the inlet pipe 5 and the outlet pipe 6 for the heating medium. Communicating with and extending from the inner end of the cylindrical chamber of head 4^g are a plurality of tubes 4^b constituting separate U-shaped or return circuit members, as shown in Fig. 3, four of these members being shown. The inner ends of these members are spaced from the inner end of the shell 1 and are provided with squared extensions at their ends having plug members 4^c screwed into the ends thereof in alinemnt with each of the tubes. By removal of these plugs, access may be had to the interior of the tubes for cleaning or other purposes when the member 4 is withdrawn from the member 1. The shell 1 is provided at substantially opposite sides with grooves 1^c formed in a thickened portion thereof and one of the units of the tubes designated specifically as 4^e, is formed as a partition, the ends of which are provided with tongues fitted into the grooves 1^c so that the casing or shell 1 is divided into two longitudinal compartments. A partition member 4^f extends across the cylindrical chamber in the

head 4^g separating the inlet and outlet pipes 5 and 6 and the partition formed by 4^e extends between the oppositely disposed tubes 4^b and the closed circuit members formed thereby so that half of the tubes 4^b are on one side of said latter partition and half on the other. The partition 4^f extends in a direction substantially normal to the partition formed by unit 4^e.

In operation, the heating medium will enter through the pipe 5 and into one side of the tubes 4^b, passing around the ends thereof and through the other side of tubes 4^b and out through pipe 6. The fluid to be heated will enter through the pipe 2, will pass around the tubes 4^b between the same and the shell 1 on one side of the partition formed by member 4^e up around said partition at the end of the tubes 4^b and out through the pipe 3.

In the modification shown in Figs. 4 and 5, a second shell or casing 7 is provided into which the casing or shell 9, similar to the shell 1, is disposed. The shells 9 and 7 are then made as one casting and the supporting lugs 7^a are formed on the outer casing 7. The two shells are provided with a flange or plate 7^b at one end and a core member 8 similar in all respects to the base or core member 4, is disposed inside of the shell 9. This core member is provided with a flange 8^a similar to the flange 4^a which is bolted to the plate 7^a by spaced circumferential bolts, a suitable packing member being interposed between said members. The core 8 is provided with the end bosses and the inlet and outlet steam pipes 10 and 11 communicate therewith. The tubes 8^b are formed in the same manner as the tubes 4^b and the casing 9 is, likewise, divided by a partition formed by one set of these tubes, as clearly shown in Fig. 5. The outer casing 7 is provided with substantially oppositely disposed ribs 7^c extending into close proximity with the outer side of the casing 9 and this casing is provided with oppositely arranged lateral bosses 7^d having threaded openings extended therethrough into which are fitted the inlet pipe 12 and the outlet pipe 13 for the heated fluid which passes between members 7 and 9. The shell 7 is also provided with oppositely arranged lateral bosses 7^e having threaded openings therethrough and from which channels extend into the inner shell 9 and inlet pipe 14 and outlet pipe 15 are fitted into these bosses.

In the operation of this device the heating medium will enter the pipes 10 and circulate through the inner core member 8 in the same manner as described for the core member 4, passing out through the pipes 11. The fluid to be heated will enter pipe 14 and pass into the interior of the shell 9 around the partition therein and the tubes 8^b and out through the pipe 15 in the same manner as described above. Another circulation of heated fluid will be maintained through the pipes 12 and 13 into the space between the casings 7 and 9 up and around the partition 7^c which extends only to the end of the inner shell 9 around the end of said shell and out through the pipes 13.

From the above description it is seen that applicant has provided a very simple and efficient water heater. In the form shown in Figs. 1 and 3, but two castings are used and this is also true of the form shown in Figs. 4 and 5, and in each arrangement there is but one packing joint.

There is a great advantage in having the heating medium passed through the separate units formed by the tubes 4^b. It will be noted that the cool water coming in through conduit 2 in Fig. 1 or through conduit 15 in Fig. 5 will contact with the first separate unit of tubes. The water will be heated to a higher temperature and will then contact with another separate unit and pass around the partition and successively come in contact as its temperature is raised with the other units. Each separate unit of tubes therefore is located in a strata of water of substantially uniform temperature. There is thus no twisting or distorting strains exerted in the unit caused by handling water of widely varying temperatures as is the case where all of the tubes communicate with one common chamber at the end. Great difficulty has been experienced in practice with heaters using cast iron tubes where water of widely different temperatures is brought into contact with pipes carrying the heating medium. The strains thus caused quickly loosen the joints and produce leaks. This problem has been effectively solved by the use of separate units herein disclosed.

The construction of the heater is exceedingly compact and the same may be made in various sizes, depending upon the capacity desired. Separate heaters may thus be disposed in various rooms of the house or the various places where hot water is desired.

It will, of course, be understood that various changes may be made in the form, details and proportions of the device without departing from the scope of applicant's invention, which, generally stated, consists in the matter shown and described and set forth in the appended claims.

What is claimed is:

1. A water heater comprising a shell, a core member formed of a multiplicity of tubes constituting a plurality of closed circuit units spaced from the inner end of the shell, one of said units constituting a partition dividing said shell into two chambers with a group of units in each chamber, means for introducing and withdrawing a heating fluid into and from the tubes so as to cause it to circulate through said units,

and means for introducing a fluid to be heated into one chamber of the shell and withdrawing it from the other chamber of the shell whereby said latter fluid is caused to circulate around all of said tubes.

2. A water heater comprising an outer shell open at one end, an inner core member formed of a multiplicity of U-shaped tubes secured in water-tight relation with said shell at the open end, and extending therein constituting a plurality of closed circuit units, one of said units being constructed to form a partition and engaging grooves formed in the sides of said shell and dividing it into two chambers, a pair of chambers at the other end of the core, each chamber communicating with one end of all of said tubes, a pipe for introducing a heating fluid into one of said pair of chambers, a pipe for withdrawing said fluid from the other of said pair of chambers, and means for circulating a fluid to be heated within the shell about all of said tubes.

3. A water heater comprising an outer shell having a pair of opposite longitudinal grooves, an inner core member formed of a multiplicity of U-shaped tubes secured in water-tight relation within the shell constituting a plurality of continuous circulation units, one of which is formed as a partition extending across said shell and having portions entering said grooves for dividing said shell into two communicating parts, means for permitting a heating fluid to circulate through the tubes, inlet and outlet pipes respectively for drawing a fluid to be heated into the shell at one end of said partition and withdrawing it from the shell at the other side of the partition whereby said latter fluid is caused to circulate around all of said tubes.

4. A water heater comprising an integral casing comprising a base, having therein a chamber a multiplicity of open ended U-shaped tubes, each in communication with said chamber at one end thereof and forming a plurality of return circuit units, a partition member is said chamber separating one of the open ends of each of said tubes from the other open end thereof, said tubes being provided at their other ends with core openings in longitudinal alinement therewith, and screw plugs secured in said core openings.

5. A water heater comprising a casing having an interior chamber with a transverse partition dividing the same into two compartments, a plurality of U-shaped tube units, each having one of its legs in communication with one of said compartments and its other leg in communication with the other of said compartments whereby a circulation can be maintained from one compartment through the tubes and into a heating other compartment, a pipe for admitting the fluid into one of said compartments, a pipe for withdrawing said fluid from the other of said compartments, a shell secured to said casing and surrounding said chamber and tubes, one of said tube units being formed as a partition dividing said shell into two chambers communicating with each other at the end of said shell remote from said casing, said chambers each containing half of said complete U-shaped tube units whereby said second mentioned partition extends substantially normal to said first mentioned partition.

6. A water heater comprising an inner casing formed as a cylindrical chamber at one end having a transverse partition dividing the same into two compartments, a plurality of U-shaped tubes extending from said chamber, one side of each of said tubes communicating with one compartment and the other side of each of said tubes communicating with the other compartment, an outer shell surrounding said casing and provided with oppositely disposed grooves, one of said tubes being formed as a partition having portions engaging in said grooves for dividing the shell into two chambers communicating at one end.

7. A water heater having in combination spaced shell members, inlet and outlet tubes communicating with the space therebetween, a core member formed as a cylindrical chamber at one end divided into two compartments, a plurality of return circuit tubes communicating therewith secured in said inner shell, inlet and outlet pipes communicating with said inner shell, and inlet and outlet pipes communicating with the two compartments of said chamber.

8. The structure set forth in claim 7, one of said tubes of said core member being formed as a partition dividing said inner shell into two chambers communicating in one end.

9. A water heater comprising a shell having a closed end and an open flanged end, an inlet and outlet means adjacent said open end and disposed, respectively, on opposite sides of said shell, a core member secured in and closing the open end of said shell and having a flange bolted to said flanged end, said core member having a divided chamber at its outer end, inlet and outlet conduits connected, respectively, to the parts of said chamber, and a plurality of closed circuit units extending from said chamber into and spaced from the walls of said shell.

10. A water heater comprising a shell, a core member fitted in the end of said shell and comprising a divided chamber, inlet and outlet conduits connected, respectively, to the parts of said chamber, a plurality of closed circuit units extending from said chamber and extending into and spaced from the walls and inner end of said shell,

one of said units constituting a partition dividing said shell into two chambers, and means for introducing a fluid to be heated into said shell at one side of said partition adjacent the end thereof and withdrawing said fluid from the said shell at the other side of said partition adjacent one end thereof.

11. A water heater having in combination, a casing comprising spaced concentric shells having spaced closed ends but connected at their other ends, said latter end of the inner shell being open, a partition extending longitudinally between said shells, oppositely disposed inlet and outlet conduits open in the space between said shells at opposite sides of said partition, oppositely disposed inlet and outlet conduits extending through said outer shell into said inner shell, a partition extending longitudinally of said inner shell to adjacent its closed end and disposed between said latter inlet and outlet conduits, a set of U-shaped open ended tubes in said inner shell at each side of said last mentioned partition, a member secured to the outer end of said casing having a chambered head fitting in the open end of said inner shell, said tubes opening into said chamber, and separated inlet and outlet conduits extending from said member and communicating, respectively with different ends of each of said U-shaped tubes.

In testimony whereof I affix my signature.

VIRGIL F. DECKERT.