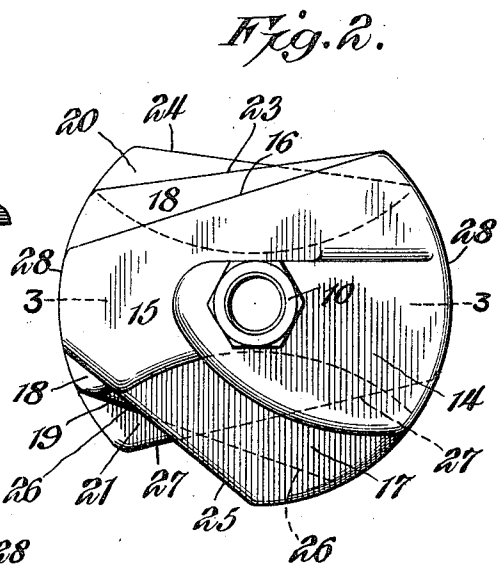
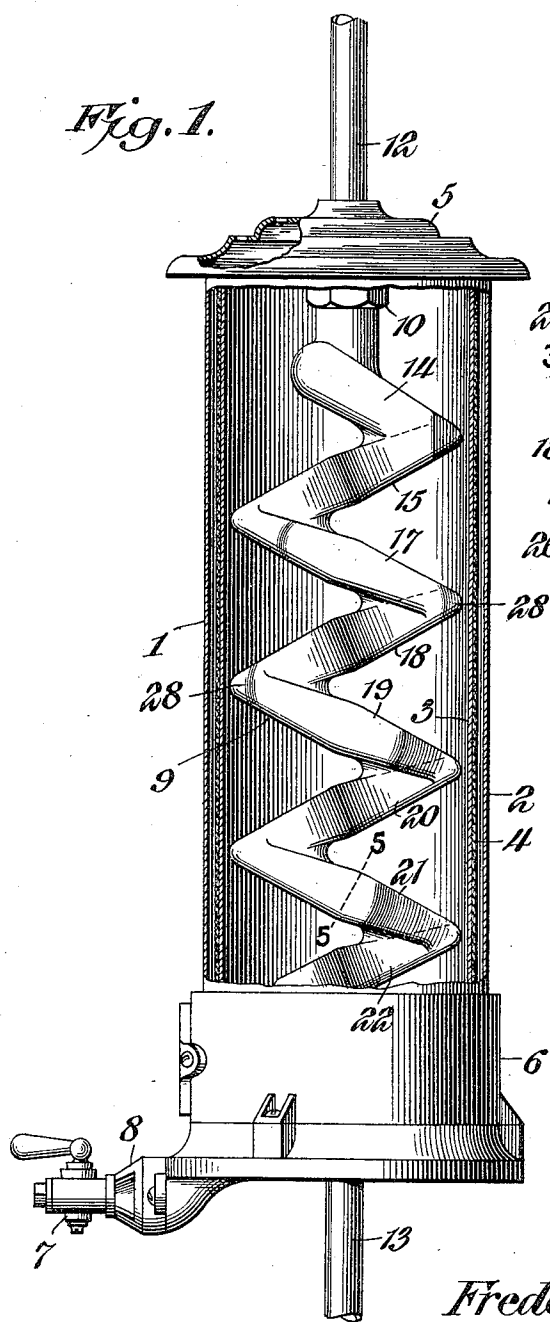


F. H. OEHLKE.
 WATER HEATER.
 APPLICATION FILED MAY 16, 1911.

1,017,012.

Patented Feb. 13, 1912.
 2 SHEETS—SHEET 1.



Witnesses
 Howard D. Orr.
 F. T. Chapman

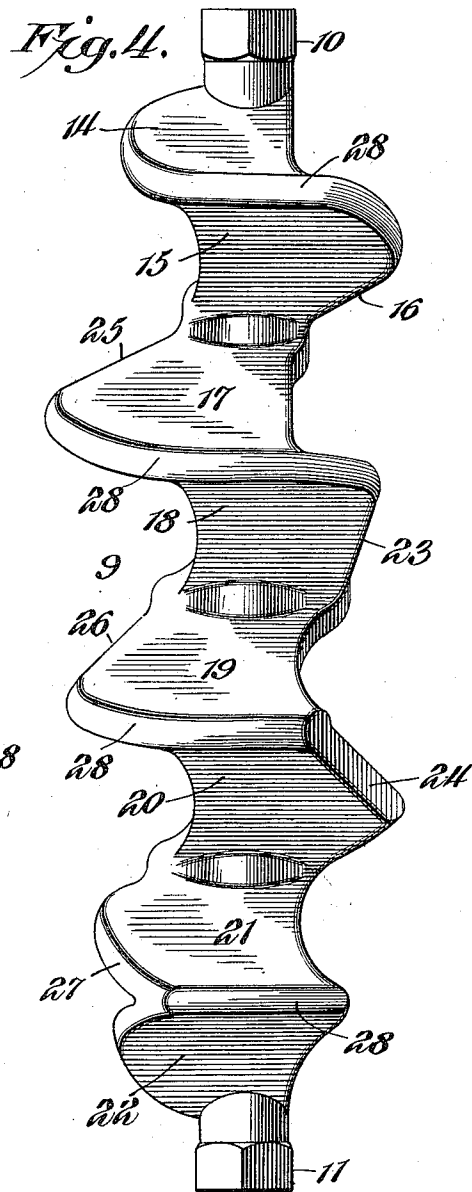
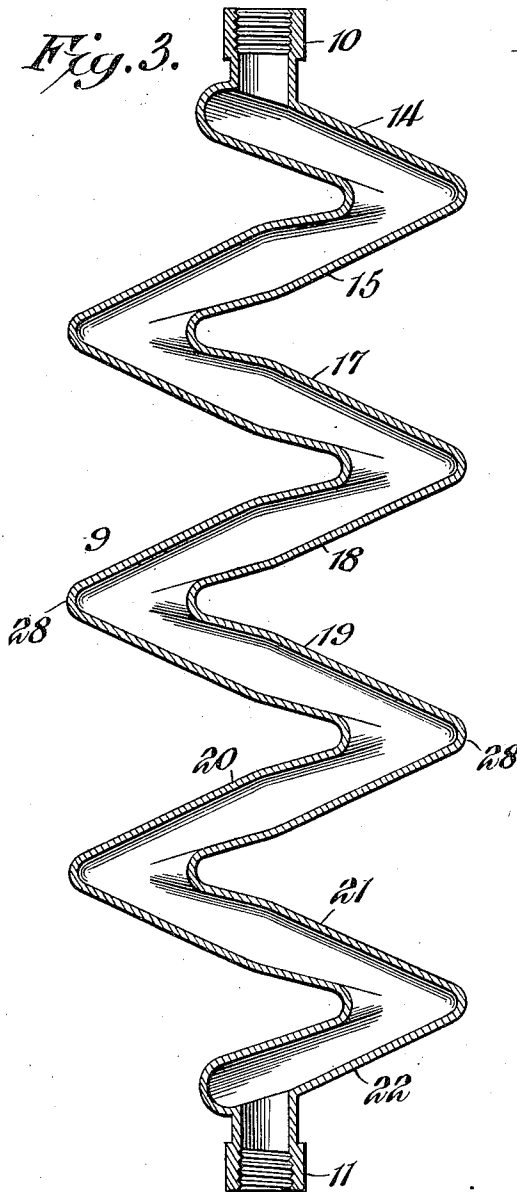
Frederick H. Oehlke, Inventor,
 By *E. G. Siggers*
 Attorney

F. H. OEHLKE.
WATER HEATER.
APPLICATION FILED MAY 16, 1911.

1,017,012.

Patented Feb. 13, 1912.

2 SHEETS—SHEET 2.



Frederick H. Oehlke, Inventor,

Witnesses

Howard D. Orr.
J. T. Chapman

By

E. J. Siggers.
Attorney

UNITED STATES PATENT OFFICE.

FREDERICK H. OEHLKE, OF LORAIN, OHIO, ASSIGNOR TO HOFFMAN HEATER COMPANY,
OF LORAIN, OHIO, A CORPORATION OF OHIO.

WATER-HEATER.

1,017,012.

Specification of Letters Patent.

Patented Feb. 13, 1912.

Application filed May 16, 1911. Serial No. 627,587.

To all whom it may concern:

Be it known that I, FREDERICK H. OEHLKE, a citizen of the United States, residing at Lorain, in the county of Lorain and State of Ohio, have invented a new and useful Water-Heater, of which the following is a specification.

This invention has reference to improvements in water heaters, wherein a heating coil is housed in a jacket or casing, the water passing through the coil and the flame being directed against the exterior of the coil within the jacket.

The object of the present invention is to provide a heating coil of long life and which may be readily cleaned, and where the products of combustion are brought into intimate contact through a tortuous path with the walls of the heating coil.

The invention comprises a casting usually of iron so constructed that the water traversing it must pass over the entire heating surface of the coil, and the structure is such that the water is caused to traverse a tortuous path through comparatively flat conduits, and the products of combustion are also caused by the form of the coil to traverse a tortuous path, whereby all surfaces of the branches of the tortuous conduit are subjected to the hot gases, thus greatly enhancing the efficiency of the structure. The coil is in the form of a single continuous casting from end to end and of general serpentine shape with the branches staggered so as to extend alternately to opposite sides of a medial plane.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings, forming a part of this specification with the understanding, however, that while the disclosure of the drawings is that of a practical form of the invention, the latter is susceptible of other embodiments and, therefore, includes such changes and modifications as do not mark a departure from the scope of the invention.

In the drawings:—Figure 1 is an elevation of the heater with part of the casing shown in longitudinal section. Fig. 2 is a top plan view of the heating coil with the casing omitted and drawn to a larger scale than Fig. 1. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is an elevation of the heating coil alone as viewed from the right

hand side of Figs. 1 or 2 and drawn to a larger scale. Fig. 5 is a section on the line 5—5 of Fig. 1, but drawn to the scale of the other figures.

Referring to the drawings, there is shown a casing 1, which so far as the present invention is concerned, may be constructed in any suitable manner. It is customary to form the casing of two steel jackets 2, 3 with a lining 4 of some suitable refractory material, such as asbestos board, there being a dead air space between the two jackets for thermo-insulation, whereby but little heat is lost through radiation. The jacket is provided with a cap or cover member 5 and a base member 6, through which latter fuel may be conveyed by way of a valve 7 and air check 8 to a burner, which because it does not enter into the present invention, has not been shown.

Within the casing there is housed a coil 9 constructed in accordance with the present invention and provided at each end with tapped terminal members 10 and 11, respectively, whereby pipes 12 and 13, respectively, may be coupled to the coil for conveying water to and from the latter. The tapped terminal members 10 and 11 may be and usually are in alinement one with the other and in the longitudinal axis of the coil as a whole. The terminal member 10 communicates with a conduit branch 14, which in the main, is to one side of the longitudinal plane of the section of Fig. 3, and this branch widens from the terminal member toward the end remote from the terminal member, where it merges into another branch 15, which in the main, is to the other side of the longitudinal plane of the section of Fig. 3 and inclines oppositely from the branch 14, the junction portion of the branch 14 with the corresponding end of the branch 15 occupying about or a little more than one half the width of the corresponding portion of the branch 15, and projecting to a greater extent away from the medial plane under consideration than the corresponding end of the branch 15.

That end of the branch 15 remote from the point of connection with branch 14 is narrowed and the edge of the branch 15 remote from the branch 14 is designated by the reference numeral 16 and is at an angle to the plane of the section of Fig. 3.

In the particular showing of the drawings

there are succeeding branches 17, 18, 19, 20 and 21 with a terminal branch 22 merged into the terminal axial member 11, the branch 14 merging into the terminal axial member 10.

The branches 18 and 20 have relatively straight edges 23, 24, respectively, corresponding to the edge 16 of the branch 15, the edge 23 approaching more nearly to parallelism with the plane of the section of Fig. 3 than does the edge 16, and the edge 24 passing the position of parallelism and inclining in the opposite direction from the edge 23. The branches 17, 19 and 21 have relatively straight edges 25, 26 and 27, respectively, disposed similarly but oppositely to the edges 16, 23 and 24 of the other branches, that is, the edges 25, 26 and 27 are on the opposite side of the plane of the section of Fig. 3 from the edges 16, 23 and 24.

Each branch is comparatively wide at one end and narrows toward the other end, and these branches are joined at alternately opposite ends one to the other in series with their junction portions all cut by the plane of the section of Fig. 3. The result of this construction is that while there is provided a passage throughout the length of the coil 9, which passage is in general serpentine in form, but is directed alternately toward opposite sides of the medial plane coincident with the plane of Fig. 3. Each branch at the end remote from the central longitudinal axis of the coil is rounded into conformity with the cylindrical shape of the inner wall of the casing, so that when housed in the casing these rounded edges indicated generally by the reference numeral 28 may be placed into quite close proximity to the inner wall of the casing, so that the products of combustion must in a great measure find passage through the casing other than between the edges 28 and the inner wall of the casing. This freer passage is provided by the spaces left by staggering the sections of the coil with relation to the plane of the section of Fig. 3, so that the major portions of the sections are alternately on opposite sides of the plane under consideration, whereby the products of combustion find free passage from the burner by one edge wall of the coil section nearest the burner, then by the edge of the next section on the other side of the plane under consideration, and then to the side of the next succeeding section on the same side of the plane under consideration as the first mentioned edge and so on throughout the coil, the path of the freest passage of the products of combustion changing from one side to the other of the coil in alternation serially. The result of this is that the products of combustion will strike the wall of the coil nearest the burner and then around the edge of the section first engaged, over

the upper face of the same, considering the coil as upright, and at the same time against the under face of the next higher coil section, thence across the upper face of the last named coil section and the under face of the still higher coil section and so on throughout the coil, whereby the products of combustion follow a tortuous or serpentine path zigzagging through the coil from one side to the other until they finally escape through the top of the casing, which latter may be constructed in the usual manner for such purpose.

Water flowing through the coil, say entering through the pipe 13 and escaping through the pipe 12, first enters the section 22 where because of the flat and expanded form of the section, it is spread out into a comparatively broad sheet, thence to the section 21 where it is likewise spread out into a broad sheet, and so on through the several sections until it reaches the pipe 12. Assuming the water entering through the pipe 13 to be quite cold, it will be subjected to the heating effect of the flame direct against a comparatively broad surface presented by the section 22, thence through the other sections to the outlet of the coil for in each section the water is subjected to the heating effect of the flame or hot products of combustion acting on a broad surface of metal, presenting to the water a broad heating surface much wider than the thickness of the column of water and the water is attacked by the heat over two broad surfaces separated by a comparatively thin layer of water, so that the temperature of the water is quickly raised because of the broad surface presented, while the products of combustion are constrained to act on the heating surfaces for a comparatively long period of time due to the tortuous path through which the products of combustion will pass.

It will be observed that the water is directed through the coil in a serpentine path approaching in form a flat helix described about the longitudinal axis of the coil, the water being constrained to flow in wide thin channels of approximately segmental form in alternately inclined relation and extending on opposite sides of the central longitudinal axis of the coil but all cut by a central axial plane. Because of the disposition of the serpentine channels the path of the products of combustion also defines a serpentine path causing the products of combustion to move across the comparatively flat faces of the segmental coil sections in a direction defined by a flat helix described about the longitudinal axis of the coil.

In Fig. 5 the general cross sectional form of one of the sections, say the section 21, is indicated and this may be taken as generally typical of the cross sectional shape of all of the sections at corresponding points.

By the construction of the coil both the water and the products of combustion are constrained to approximately serpentine paths, each approaching in form a flat helix and the path of the water and the path of the products of combustion are in interlaced relation, whereby the action of the products of combustion upon the water is prolonged. This occurs not only because of the comparatively long paths through which paths the water and the products of combustion must pass, but the broadening of the water channels causes a comparatively sluggish movement of the water through the coil, whereby it remains for a comparatively long time in operative relation to the heating medium, and so the heat units are very largely utilized.

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

1. A serpentine water heating coil comprising successive laterally extended sections joined together at alternate ends, the lateral extensions of successive sections being directed alternately toward opposite sides of the coil.

2. A serpentine water heating coil comprising alternate sections laterally extended in opposite directions with relation to the longitudinal axis of the coil and joined together successively at alternate ends.

3. A serpentine water heating coil comprising a longitudinal series of laterally extended sections joined together at alternate ends, the entire coil being comprised in a single casting, the sections having the lateral extensions on alternately opposite sides of the central longitudinal axis of the coil.

4. A water heating coil comprising a longitudinal series of relatively flat laterally extended sections joined together at alternate ends and provided with a continuous internal passage throughout of serpentine and approximately flat helical shape.

5. A water heating coil comprising integrally joined flat approximately segmental sections connected alternately at the ends

with a continuous passage throughout the coil, the sections being staggered with relation to the longitudinal axis of the coil.

6. A water heating coil comprising a single casting provided with axial terminal members, and intermediate members joined at alternate ends at an angle one to the other and staggered with relation to the longitudinal axis of the coil.

7. A water heating coil having a laterally extended water passage therethrough of generally serpentine form and directed alternately toward opposite sides of a medial plane, said coil defining a path for the products of combustion similar to the general shape of the water passage through the coil and in interlaced relation thereto.

8. A water heater comprising a heating coil having a serpentine laterally extended water passage therethrough with alternate branches in staggered relation to the longitudinal axis of the coil, said coil having means at the ends for the attachment of water pipes thereto, an inclosing casing for the coil, and means for the application of heat to the coil within the casing.

9. A water heater comprising a heating coil having a serpentine laterally extended water passage therethrough with alternate branches in staggered relation to the longitudinal axis of the coil, said coil having means at the ends for the attachment of water pipes thereto, an inclosing casing for the coil, and means for the application of heat to the coil within the casing, the coil having its members conforming in part to the interior shape of the casing and the other parts shaped to define in conjunction with the casing a tortuous passage for the products of combustion in interlacing relation to the path of the water through the coil.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

FREDERICK H. OEHLKE.

Witnesses:

S. A. AULT,
C. A. HOYT.