

June 28, 1938.

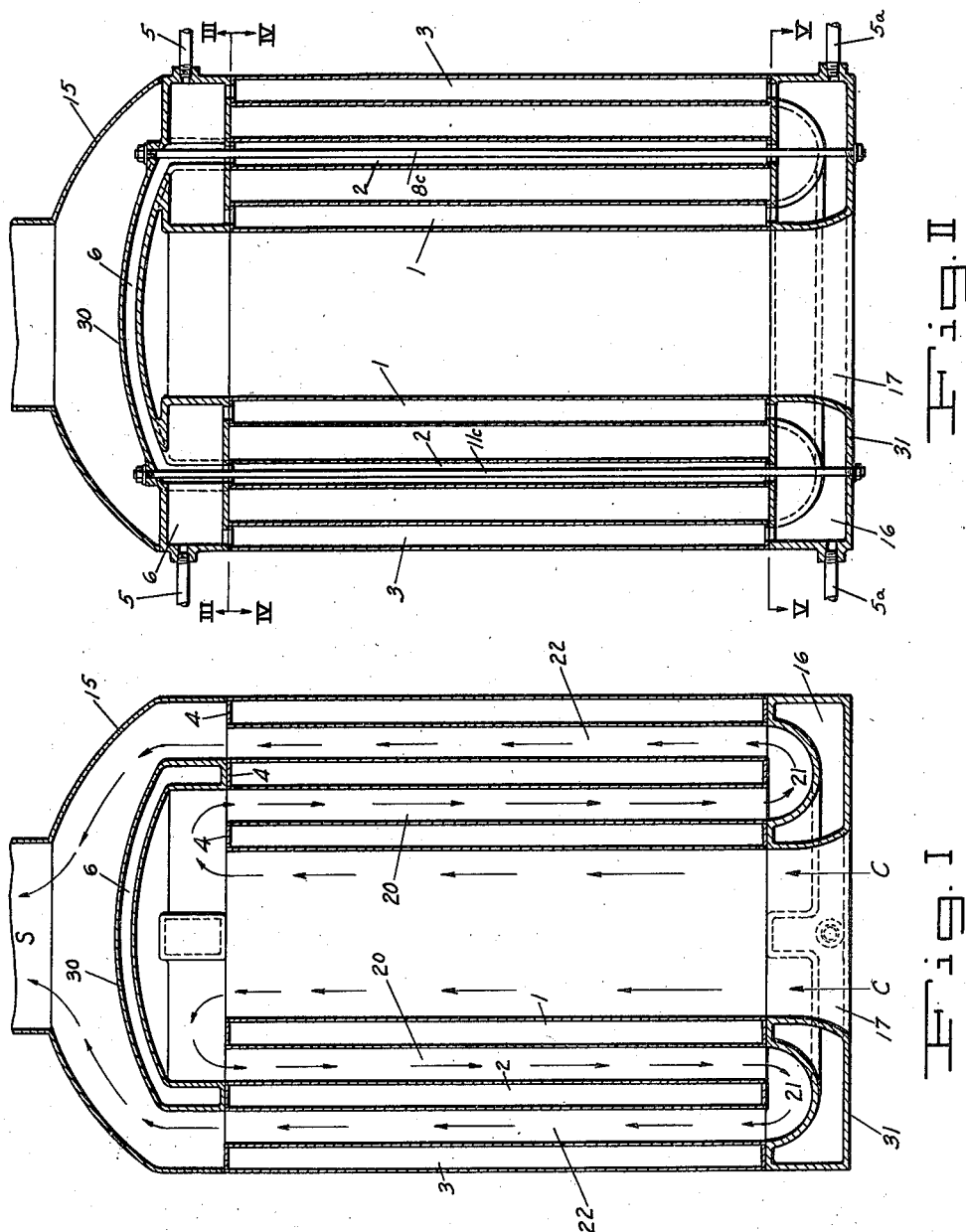
E. E. GOEHLER

2,122,228

WATER HEATER

Filed Nov. 11, 1936

2 Sheets-Sheet 1



June 28, 1938.

E. E. GOEHLER

2,122,228

WATER HEATER

Filed Nov. 11, 1936

2 Sheets-Sheet 2

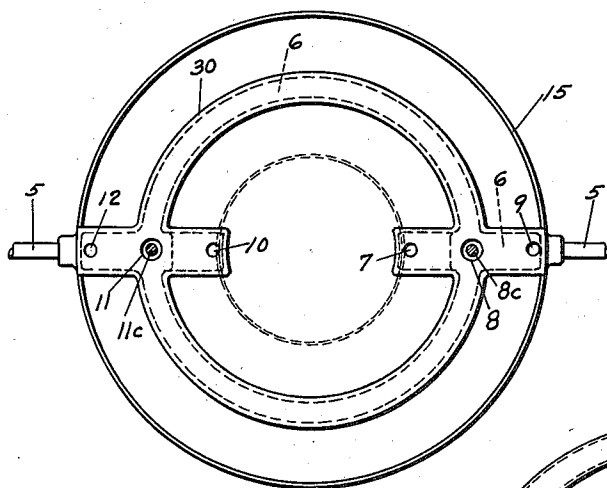


Fig. III

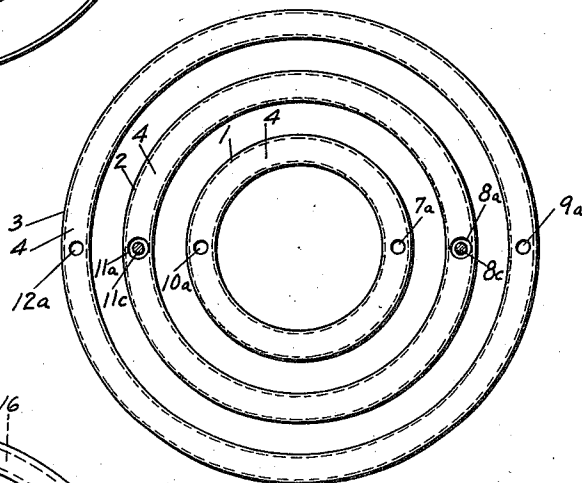


Fig. IV

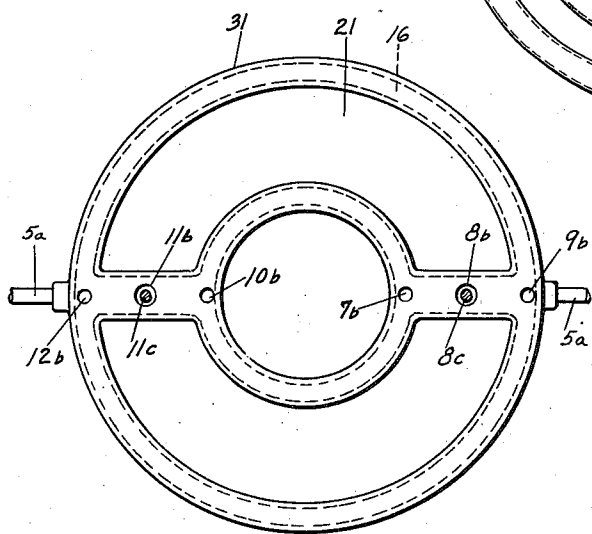


Fig. V

INVENTOR
ELMER E. GOEHLER
BY *G. F. McLaughlin*

ATTORNEY

UNITED STATES PATENT OFFICE

2,122,228

WATER HEATER

Elmer E. Goehler, Portland, Oreg., assignor to
Vortex Manufacturing Company, Portland,
Oreg., a corporation of Oregon

Application November 11, 1936, Serial No. 110,291

6 Claims. (Cl. 257-243)

This invention relates to water heaters of the type used for hot water heating systems, or for heating water at moderate pressures for domestic, hotel, bath house or other use. It is not intended for use as a steam generator at either high or low pressure.

The objects of my invention are in part as follows:

I desire to make use of the virtues of the well known sectional cast iron boiler with respect to ease of replacement of a part that may become damaged or require removal for repairs, in a boiler of which the sections are steel.

Another object of my invention is a water heater in which the advantage of multiple heating surfaces is available to absorb the radiant and convected heat from an oil burner or other source of heat, yet which offers large unobstructed vertical passageways for thermal circulation of water to be heated, without requiring it to traverse serpentine or restricted pathways or, most important, to flow contrary to the direction normally induced by applying heat, that is straight up.

Other objects are comparatively low cost, large capacity per pound of metal necessary in construction and such disposition of the metal that great strength is attained with comparatively thin walls.

Another object is the provision of steel water legs of standard diameters or lengths that may be assembled as parts of heaters of greatly different capacities by using cast heads and bases that are adapted to use less or more water legs than shown by way of illustration in the drawings.

These and other objects which will be plain from the description and drawings and which will be apparent to those skilled in the art, constitute the purpose of the present invention and are accomplished in an excellent manner by the structure illustrated in the accompanying drawings, in which,—

Fig. I is a vertical section of a circular, three water leg heater with a triple pass for the products of combustion of a burner and a single pass for the water;

Fig. II is a vertical section of the same structure shown in Fig. I on a plane normal to the plane of section in Fig. I;

Fig. III is a horizontal section at III—III of Fig. II showing the inside view of the top cap;

Fig. IV is a horizontal section at IV—IV of Fig. II showing the tops of the water legs in assembled relationship; and

Fig. V is a horizontal section at V—V, Fig. II, showing the inside view of the bottom cap with its burner opening.

In the drawings, 1, 2 and 3 are steel water legs, each of which, as used in the heater, is a separate unit; which may be formed by using two seamless steel pipes of different diameters but of the same length, inserting a member which can well be steel of annular form, unitary or with its ends welded together to form a ring 4, and which should fit snugly between the inside diameter of the larger pipe and the outside diameter of the smaller pipe, and then welding the whole structure at all external visible points of contact.

Or an outstanding flange may be rolled on the smaller of the two tubes at both ends, just sufficient so that it will go into the larger pipe, the ends of both pipes may be made to approach so that they can be welded, or any other convenient procedure that will insure a water space of ample thickness may be used.

Thus welded there is formed a very strong water leg unit in which the direct stress on the weld (due to the small area of the ring 4 that is under pressure) is of small magnitude.

In the ends of the water legs are holes, which may be drilled to register with corresponding holes in the caps 30 and 31, top and bottom respectively, the junctions of which are made tight by gaskets or other preferred and well known means.

The top cap shown in Fig. III of the drawings is provided with two outlet means indicated by the numeral 5, both of which may be used or either one selectively.

It is provided with a water space 6, shown in Figs. I, II and III and with holes 7, 8, 9, 10, 11 and 12, which are adapted for registry with the holes 7a, 8a, 9a, 10a, 11a, and 12a in the assembly of water legs illustrated in Fig. V.

The opposite end of the assembly of water legs will be provided with similar holes which register with the holes 7b, 8b, 9b, 10b, 11b and 12b. See Fig. V. Through two of these holes such as 11, 11a and 11b and 8, 8a and 8b, are placed tension bolts 11c and 8c provided with nuts as shown by which the assemblage of top and bottom caps and the series of water legs may be held in rigid and watertight relationship to each other.

A smoke cap 15 is superposed on the assemblage as shown in Figs. I and II and may be attached to the heater in any preferred man-

ner and 5a represents inlet or outlet pipes, interchangeable.

The bottom cap is provided with a water space 16, annular in form, and is provided with a central opening 17, through which the products of combustion enter from a suitable heat source to heat the water in the water heater.

The general direction of travel of the products of combustion is shown by the arrows in Fig. 1 commencing at C and terminating at the smoke outlet marked S.

The heater, when assembled, will be suitably jacketed with lagging, not shown as it is well known.

From the foregoing description as illustrated by the drawings, it will be observed that the products of combustion make three passes. That is to say, they go upward through the inside of the first water leg and down the outside thereof in the annular passageway 20, defined by the difference between the inside diameter of the center water leg and the outside diameter of the inner water leg. Thence they pass through the curved smoke passageway 21, in the bottom cap, and then upward through the annular space 22 between the outside diameter of the center water leg 2 and the inside diameter of the outer water leg 3.

It will be noted also that it is extremely easy to slow down the velocity of the products of combustion by making the passageways such as 20 and 22 of considerably greater area than the inside diameter of the water leg 1, which promotes heat transfer through the walls of the several water legs.

This heater can be very rapidly cleaned from soot accumulations by the simple expedient of removing the smoke hood 15 and the top cap 30.

It will also be noted that replacement or repair of any unit of which this heater is constructed is greatly facilitated by the ease with which it is taken apart and reassembled. Also that it presents straight passageways for the water to be heated and a three pass movement for the products of combustion.

Further that by varying the design of the top and bottom caps or by varying the length of the water legs, heaters of widely variant capacity may be produced that will occupy very small floor space in proportion to their capacity.

Having described my invention in the best way in which it is proposed to carry it out, what I claim as new and desire to secure by Letters Patent, is,—

1. In a water heater, in combination, a plurality of annular water legs of the character described assembled in spaced nested relationship, a head having a water space therein that manifolds the water spaces of the water legs and sep-

arately manifolds the air spaces between the water legs and a bottom cap that separately manifolds air and water spaces at the other end of the water legs and is provided with an axial inlet.

2. In a water heater, a plurality of unitary water legs assembled in spaced nested relationship with the ends in the same plane, top and bottom caps made rigid therewith that are formed to manifold the water spaces of the water legs and the air spaces between them, the said bottom cap being provided with an axial heat inlet opening and the said top cap being arranged to leave the space between the outer two of the water legs assembly uncovered in part.

3. In a water heater, a plurality of independent water legs of graded diameters in spaced nested relationship with the smaller inside the larger and caps for both ends that are arranged to manifold the water spaces of the water legs and the air spaces between the legs, independently, in such manner that the water spaces are straight and the air spaces are sinuous.

4. In a water heater, a plurality of independent water legs of the character described in spaced nested assembly, top and bottom cap members that are arranged to independently manifold the water and air spaces of the assembly and means for detachably attaching the cap members to the water legs.

5. In a water heater, the combination of a plurality of water legs of the character described nested in spaced annular relationship, caps effective to manifold water and air spaces at both ends of the assembly, independently, to provide a water circulation in one general direction from end to end of the assembly and to provide an indirect air circulation from the space surrounded by the innermost water leg to the annular space surrounded by the outermost water leg and bolt means for holding the several water legs and the caps in rigid water tight relationship.

6. In a water heater, a plurality of water legs of different diameters in spaced nested relationship, the innermost water leg being arranged as a combustion chamber, top and bottom manifold members having within them water spaces and arranged to connect the spaces between successive water legs by providing passage over alternate ends of successive water legs to form a continuous passageway for products of combustion, the said water legs being open end double walled cylindrical structures with an annular water space between the walls and said manifold members comprising connectors connecting the water spaces in the manifold members with the water spaces in the water legs.

ELMER E. GOEHLER.