

Dec. 24, 1940.

R. W. RUTLEDGE

2,226,076

TWO-PASS WATER TUBE BOILER

Filed July 17, 1939

3 Sheets-Sheet 1

*Fig. 1*

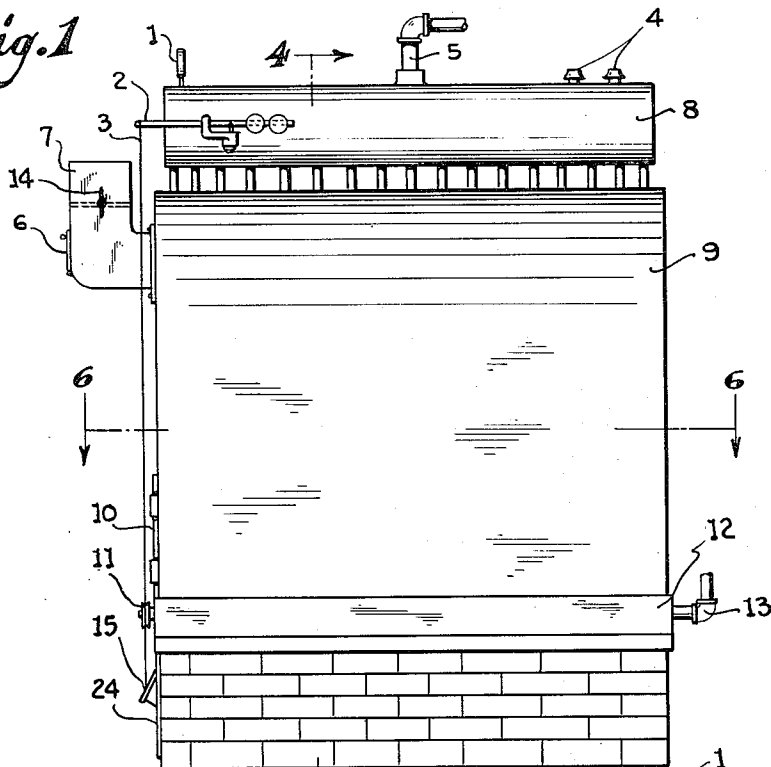


*Fig. 2*

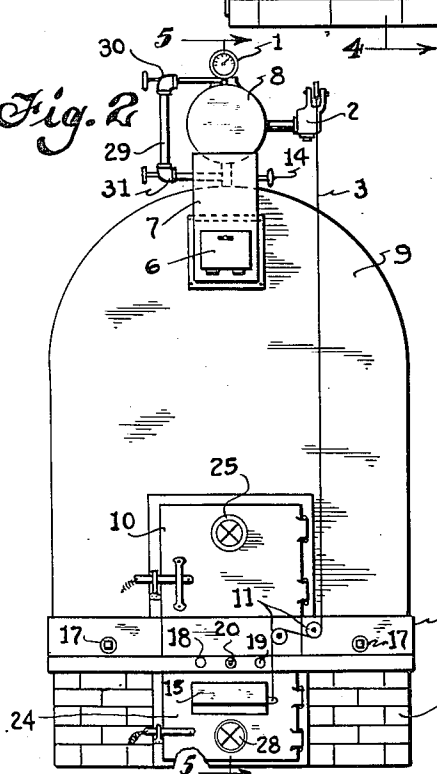
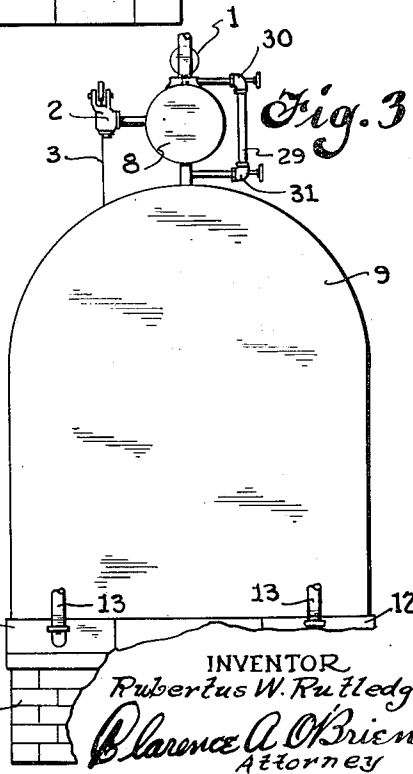


*Fig. 3*



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*Fig. 5*

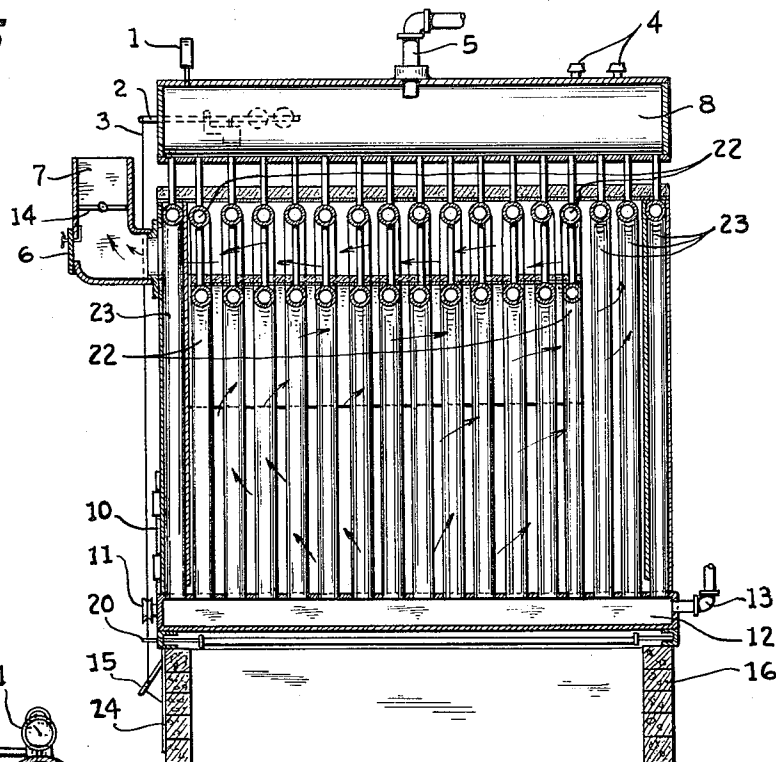
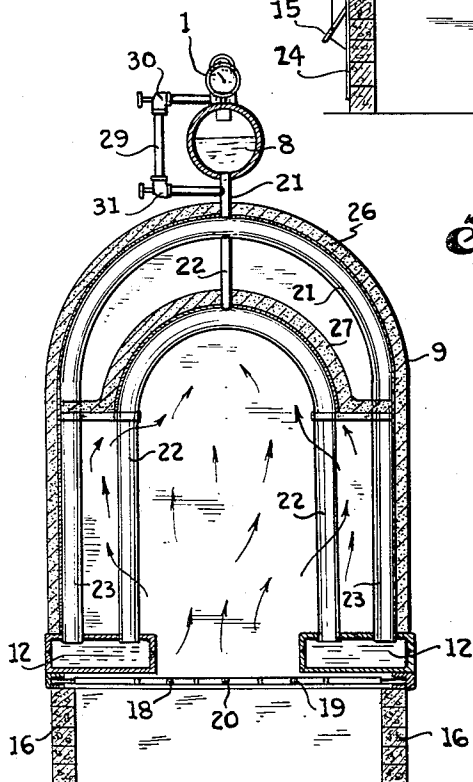


*Fig. 4*



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*Fig. 6*

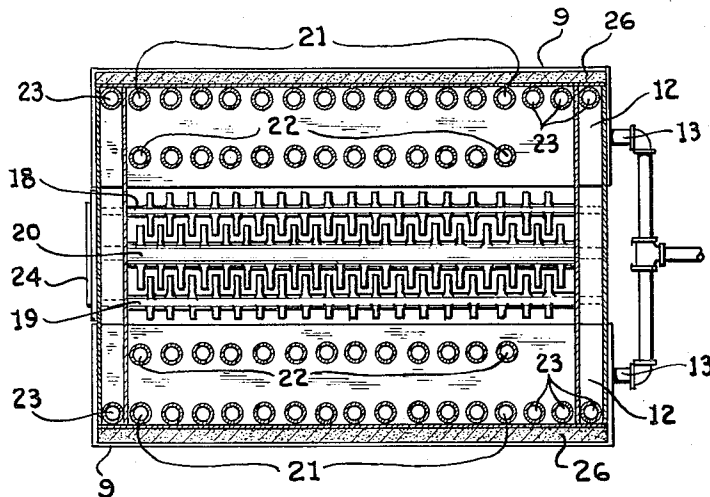


*Fig. 7*

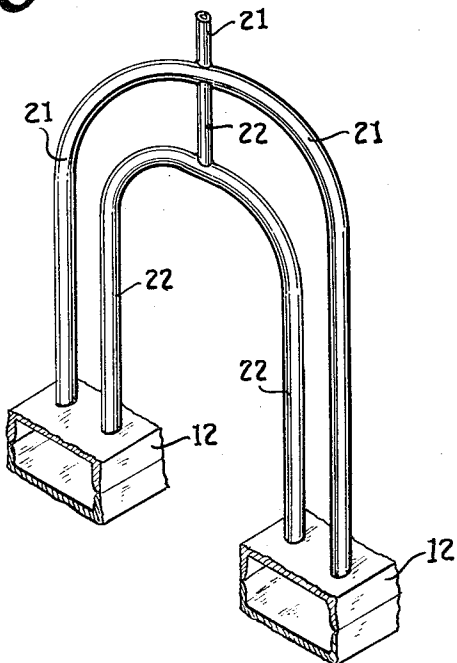
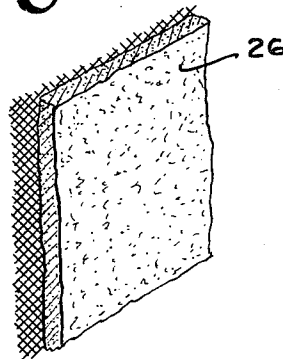


*Fig. 8*



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## UNITED STATES PATENT OFFICE

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## TWO-PASS WATER TUBE BOILER

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Application July 17, 1939, Serial No. 284,942

2 Claims. (Cl. 122-327)

The invention relates to the generation of steam in a boiler so that the entire inside area of the boiler is exposed to heat without the use of flues. All heat provided from the fire box is utilized to the best possible advantage by the two-pass design of the boiler. The object of this boiler is to eliminate fuel consumption of the unproductive type and to provide heat, or power, for homes and commercial establishments at low cost. Because of the efficient design of the boiler, it is adapted to use under conditions where boiler space is limited.

One form of the invention is illustrated in the accompanying drawings, in which Figure 1 is a side view of the exterior of the boiler; Figure 2 is a front view of the exterior of the boiler; Figure 3 is a rear view of the exterior of the boiler; Figure 4 is a vertical cross-section of the boiler, looking at the boiler from the front; Figure 5 is a vertical cross-section of the boiler, looking at the boiler from the side; Figure 6 is a horizontal section of the boiler showing the grates and bottom headers; Figure 7 is a view of a cross section of the lower header with boiler tubes attached; and Figure 8 is a view in perspective of a section of insulation such as is used in the boiler.

The water is introduced into the boiler by the inlet pipes 13 13 and it passes into the lower headers 12 12 and from the headers through the boiler tubes 22, 21 or 23 until it reaches the upper header 8.

By virtue of the two bottom header clean-out plugs 17 17, it is possible to clean the headers with a minimum of inconvenience. When the clean-out plugs 17 17 are removed, the pressure of the water coming in through the inlet pipes 13 13 is sufficient to flush out the boiler headers and the tubes.

The fuel for heating the boiler is introduced through the door 10 which may be seen upon Figure 2 and which possesses a feed door slide 25. The grates 18, 19, 20 are directly behind the feed door 10 and are located between the two bottom headers 12 12. The ashes are removed through the ash door 24 which also has a slide 28 and contains a draft door 15.

The draft door 15 is connected to a damper control cable 3 which after running through cable pulleys 11 11 is connected with an automatic draft damper valve 2. When the pressure in the header tanks reaches the amount which has been desired, the automatic draft damper valve 2 functions to regulate the ash pit draft door 15 so that the amount of heat generated will not exceed

that amount necessary to maintain the pressure desired.

In addition to the automatic safety valve 2, two release valves 4 4 have been installed in the upper header 8 and if the automatic safety valve 2 should fail to work properly, the excess pressure would be released through the release valves 4 4.

A steam gauge 1 on the header 8 shows what the pressure in the boiler is at any given time. The amount of water in the boiler may be determined by observing the water gauge glass 29 which is between the upper water column valve 30 and the lower water column valve 31.

The heat from the grates 18 19 20 is used to heat the water in the lower headers 12 12 and the accessible parts of the boiler tubes 21, 22, 23. The insulation 27 over the boiler tubes 22 causes the heat to move to the rear of the boiler in order to rise to the smoke box 7. Thus is created a two-pass boiler and the heat is further utilized by requiring it to pass along the upper boiler tubes 21 23. The smoke and unused heat finally passes out the smoke box 7 which has a clean-out door 6.

The steam which has been created passes from the header 8 out through the steam outlet 5.

The boiler is built upon a foundation 16 and is covered with a jacket 9. Directly beneath the jacket is a layer of insulation 26 which is between the jacket 9 and the row of tubes 21 23. A layer of similar insulation 27 covers the tops of the row of tubes 22 and extends horizontally to the tubes 21 23 so that the heat is prevented from rising directly to the smoke box 7 and is deflected to the rear of the boiler so that it will again pass around boiler tubes before escaping.

I am aware that prior to my invention boilers have been made using boiler tubes, and equipped with the various appliances shown in the drawings submitted, but I do not claim to have invented such boiler parts.

I claim:

1. A boiler of the class described comprising a housing, a pair of headers in the lower part of the housing adjacent the side walls thereof and spaced apart, a grate for holding the fuel between the headers, an inner series of inverted U-shaped tubes in the housing each having one end connected to one header and its other end to the opposite header, a series of outer inverted U-shaped tubes in the housing having their ends connected with the headers, the tubes of each series being spaced apart, a chamber above the top of the housing, vertical tubes connecting the chamber

with the bight parts of the tubes of the outer series, vertical tubes connecting the bight parts of the tubes of the outer series with the bight parts of the tubes of the inner series, a partition member extending horizontally in the housing and extending from one end thereof to a point spaced from the opposite end and said partition member being of inverted U-shape and located on the upper portion of the bights of the inner series of tubes and having outwardly extending parts at its side edges, said parts extending to the side walls of the housing and located at the junction of the bight parts with the straight parts of said inner series of tubes, an outlet member for the products of combustion connected with the housing above the partition member and at that end of the housing to which the end of the partition member is connected.

2. A furnace of the class described comprising a housing having a chimney connection at one end thereof, a pair of headers extending longitudinally in the lower part of the housing adjacent the side walls thereof and spaced apart, means for supporting fuel between the headers, inner and outer sets of inverted U-shaped tubes in the housing each having one end connected to one header and its opposite end to the other header, the tubes of each set being spaced apart and the inner set of tubes terminating in spaced

relation to that end of the housing which is opposite the end having the chimney connection therein, the outer set of tubes extending to said opposite end of the housing, vertical tubes connecting the bights of the inner set of tubes with the bights of the tubes of the outer set which are located above the bights of the tubes of the inner set, a chamber over the top of the housing, tubes connecting the bights of the outer set of tubes with the chamber, a partition member extending longitudinally in the housing and located above the bights of the inner set of tubes for separating said bights from the bights of the outer set, said partition member being of inverted U-shape with its side edges extending to the points of junction of the bights of the inner set of tubes with the straight portions of said tubes and said partition member having outwardly extending parts at its side edges which extend to the side walls of the housing and said partition member terminating at that inner tube which is spaced from the adjacent end of the housing and extending to the opposite end and said partition member forming a passage for the products of combustion leading to the chimney connection and means for introducing liquid into both headers from one end thereof.

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