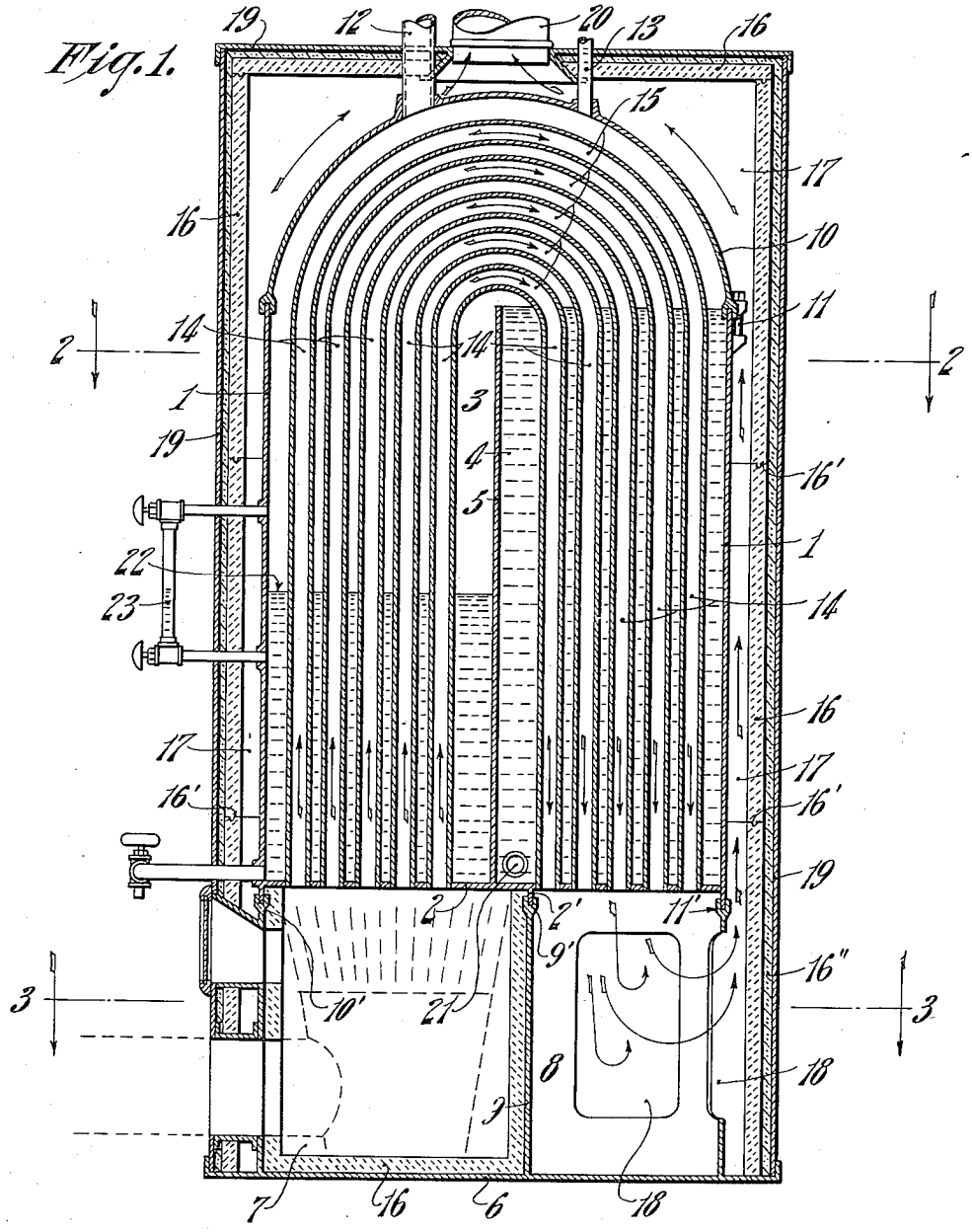
July 7, 1936. O. A. HELLIG 2,046,455

HOUSEHOLD STEAM BOILER

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Fig. 1.



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Fig. 2.

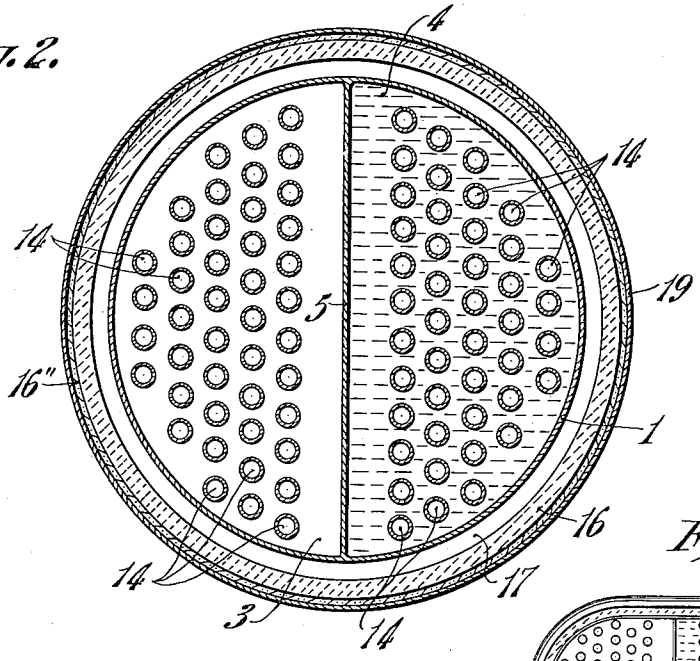


Fig. 4.

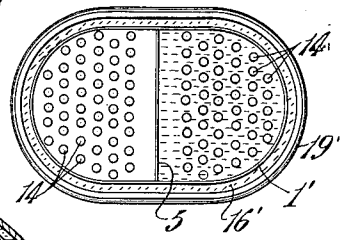
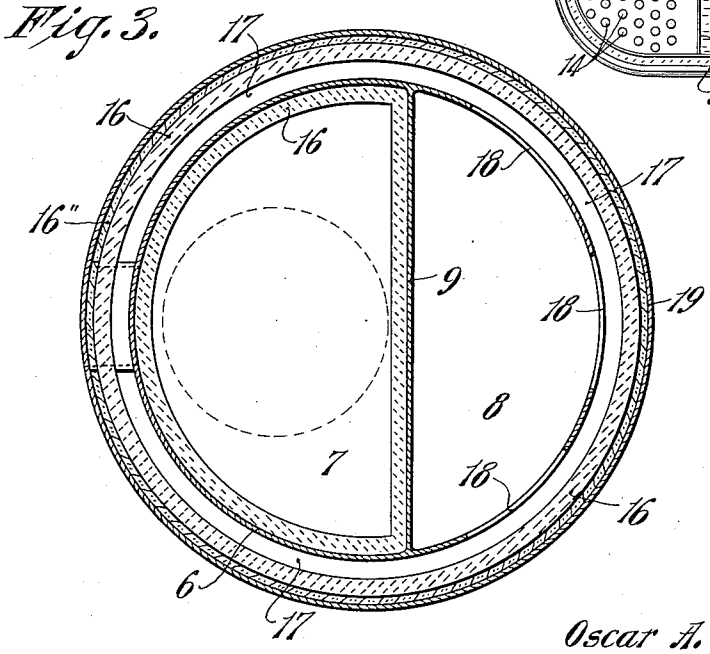


Fig. 3.



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UNITED STATES PATENT OFFICE

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HOUSEHOLD STEAM BOILER

Oscar A. Hellig, Monson, Mass.

Application August 5, 1935, Serial No. 34,746

6 Claims. (Cl. 122—45)

My invention relates to improvements in household steam boilers.

An object of my invention is to provide, in a steam boiler, means for producing rapidly, and almost instantaneously, the conversion of water into steam, immediately after the initial application of heat to the primary heating surface.

Another object of my invention is to provide, in a steam boiler, means for producing dry or superheated steam in the steam space of the boiler in which it is generated, as will be fully described.

A further object of my invention is to provide, in a steam boiler, means for introducing and storing, within the boiler, feed water for the primary steam-generating section, and means for preheating the feed water before its introduction into the primary steam generating section, or compartment.

A still further object of my invention is to provide means for thoroughly absorbing and utilizing the heat from the hot gases and products of combustion, before entering the exhaust flue, thereby providing a maximum of efficiency for the boiler in proportion to the fuel consumed, and therefore, insuring a very low final flue temperature.

These, and other objects and advantages of my invention, will be more completely disclosed and described in the following specification, the accompanying drawings, and the appended claims.

Broadly, my invention comprises an inner casing divided into a primary steam-generating compartment and a feed water heating section, or compartment, means for maintaining a much smaller volume of water in the primary steam-generating compartment, than that in the feed water heating compartment, a combustion chamber beneath the primary steam-generating compartment, a heat-resisting and insulating casing surrounding the inner casing and spaced therefrom, means for conveying the heated gases of combustion from the combustion chamber through the water in the primary steam-generating compartment, thence through the water in the feed water heating compartment, thence through the annular space between the inner casing and the heat-resisting and insulating casing to the exhaust flue, and an outer protective casing surrounding the heat-resisting and insulating casing, with heat-insulating material within the outer casing.

A preferred embodiment of my invention is illustrated in the accompanying drawings, in which:—

Fig. 1 is a vertical, sectional view of the boiler.

Fig. 2 is a horizontal, cross sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal, cross sectional view taken on the line 3—3 of Fig. 1, and Fig. 4 is a modification.

Referring now to the drawings in detail, in which like numerals refer to like parts throughout:—

An inner casing 1, having a floor, base plate or sheet 2, and divided into compartments 3 and 4 by a vertical partition 5, is mounted upon a base member 6, which is divided into a combustion chamber 7 and flue chamber 8, by means of a partition 9. The top of the casing 1 is closed by a semi-spherical dome 10, which may be bolted thereto, as indicated at 11, in Fig. 1. A steam main 12 and a nipple 13, for connection to a safety valve, (not shown), are connected to the top of the dome 10 and communicate with the interior of the dome 10. Fire tubes 14, located on and secured to the base plate 2, at the bottom of the primary steam-generating compartment 3, and communicating with the combustion chamber 7, extend upwardly through the compartment 3, and are looped at 15, in the form of semi-circles, within the dome 10 and extend downwardly through the compartment 4, through the base plate 2, thus providing passages for the gases and products of combustion from the combustion chamber 7, through the compartments 3 and 4, into the flue chamber 8. A sectional casing 16, of suitable heat-resisting and insulating material, surrounds the casing 1, base 6, and dome 10, and is spaced therefrom to provide an annular smoke passageway or flue 17. The section lines of the material 16 are indicated at 16'. Communication between the flue 17 and the flue chamber 8 is provided by means of a plurality of openings 18 in the wall of the chamber 8. An outer, protective casing 19 with a filling 16'' of asbestos and having 85% magnesium, located therein, surrounds the heat-resisting and insulating casing 16, and has connected, at the top thereof, an exhaust flue 20, which communicates with the annular flue 17, as indicated in Fig. 1. Water is supplied to the compartment 4 by means of an inlet pipe 21, to which the return—from the steam system would also connect. As water enters the compartment 4 from the pipe 21, and fills the same, it will overflow into the compartment 3, over the top of the partition 5. The water in the compart-

ment 3 is maintained at a lower level than that in the compartment 4, as indicated at 22, in Fig. 1. A gauge glass 23 aids in controlling the level 22. It will be noted that a relatively small volume of water is maintained in the compartment 3 over the combustion chamber 7, in comparison with the volume of water in the compartment 4.

In operation, when combustion of fuel takes place in the chamber 7, the gases of combustion pass upwardly through the tubes 14 in the compartment 3, across, above the partition 5 in the loops 15, thence downwardly through the tubes 14, in the compartment 4 into the flue chamber 8, then through the openings 18 into the annular flue 17, then upwardly around the casing 1 in the annular flue 17, to the exhaust flue 20. Some of the small volume of water in the compartment 3 is quickly converted into steam by absorption of heat from the base plate 2 and the tubes 14. As this steam passes upwardly through the compartment 3, above the surface 22, it is dried, or superheated, by continued contact with the hot tubes 14. As the hot gases continue downwardly in the pipes, or tubes 14, through the compartment 4, heat is absorbed by the water in the compartment 4, thus reducing the amount of heat required to convert this water into steam, when it overflows into the compartment 3, also, some steam will be generated in compartment 4. More heat is absorbed by the water in both compartments 3 and 4, through the casing 1, as the hot gases pass around and upwardly in the annular flue 17. Thus, a maximum of absorption of heat from the gases of combustion is acquired before these gases reach the exhaust flue 20; steam is produced very quickly by maintaining a small volume of water in the primary steam-generating compartment 3, and the steam thus produced is dried, or superheated, by the tubes 14, before it reaches the steam main 12.

The joint between the base plate 2 and partition 9 is closed by means of the depending portion 2' and cup-shaped portion 9', which is then sealed with a suitable cement. The same construction is shown at 10' and 11'.

The refractory and insulating material 16, being spaced a distance from the boiler to provide the flue 17, serves a four-fold purpose; first, an air-tight casing around and over the entire boiler proper; second, it will absorb and store some of the heat from the hot gases as they pass around and upward in the annular flue 17; third, it provides a means of actually insulating the boiler substantially 100% against heat radiation loss, because of the fact that the gas temperature is very much greater than the temperature of any part of the boiler and its contents, which it surrounds, and, are in contact with the boiler; fourth, the material 16 will prolong the steaming period of the boiler by giving off the heat that is stored therein, when the volume of combustion is decreased, or entirely diminished, as in the modern automatic fuel oil type burner.

The partition 5 serves materially as a strengthening stay for the boiler casing, since it is secured to the plate 2 and the inner surface of the casing, as shown.

Referring to Fig. 4, the boiler casing 1' is shown elliptical, in plan. This construction serves the purpose of providing more space on the opposite sides of the partition 5, whereby, more combustion tubes 14 may be inserted than in a round boiler, and therefore, more square feet of heating surface in the boiler.

Due to the fact that the very hot products of combustion, which pass or travel through only a short proportionate length of each tube and are surrounded by water at low level, in the primary steam-generating section, the temperature of these gases, while traveling in the portion of the tubes between the water level 22 in compartment 3, and the water level at the top of compartment 4, will emit or give off a high temperature radiation effect from the outer surfaces of the tubes 14 and the result is that dry or superheated steam is being delivered through the steam main 12.

By reason of the small volume of water maintained in the primary steam-generating compartment 3, and the highest temperature of combustion gases passing upwardly through the tubes 14 in the compartment 3, some of the water therein will be quickly converted into steam and the combustion temperature will obviously be lowered or decreased, but the remaining high temperature of combustion will be sufficiently high enough to produce and deliver dry or superheated steam by the radiating heat given off from the outer tube surface which is completely surrounded by steam that is traveling upwardly in compartment 3 and through the main steam port outlet 12.

It is to be understood that the arrangement of the tubes 14 is not necessarily that shown in the drawings, as any other obvious arrangement may be made without departing from the spirit and scope of my invention.

What I claim is:—

1. A steam generating boiler having an inner casing member, a base plate secured thereto, a partition in the casing extending from the base plate for a portion of the length of the casing for providing a plurality of compartments in the casing, and continuous fire tubes in the casing having both ends secured to the base plate and extending over the unsecured end of the partition, said pipes serving to convey products of combustion.

2. A steam-generating boiler comprising, a casing member, a base plate, a partition member secured to the base plate and the opposite sides of the casing with its upper end located a distance below the upper inner surface of the casing for dividing the casing into two compartments, whereby different water levels are maintained in the compartments, a fire box below the base plate, and fire tubes within the casing in communication with the fire box and having their ends secured to the base plate and extending over the partition member and located in the compartments.

3. Means for drying or superheating steam in a steam boiler comprising, a water-receiving casing, a partition member in the casing dividing the same into two compartments for effecting different water levels, means for supplying water to one compartment for filling the same and causing it to overflow into the other compartment at a lower level, water-heating tubes disposed wholly within the casing, extending into the water in both compartments and above the water levels therein, whereby the steam in the space above both water levels will be dried or superheated by the tubes and the water in the compartment having the higher level will be preheated before it flows over into the lower water level and the temperature of the final flue gases

will be materially lowered before discharged to the atmosphere.

4. A steam generating boiler comprising, a water-receiving casing, a base plate, a combustion and smoke compartment below the base plate, a partition in the casing designed to provide different water levels in the casing, tubular members lying wholly within the casing having their opposite ends secured to the base plate and terminating at the combustion and smoke compartments, respectively, and extending over the partition, an annular passageway surrounding the casing for the waste gases, said passageway having a refractory and insulating substance as a confining member for the waste gases, whereby the said material utilizes heat and waste gases to check boiler radiation, as described.

5. A steam generating boiler comprising, a water receiving casing, a base plate, a combustion and smoke compartment below the base plate, a partition in the casing designed to provide different water levels in the casing, tubular members lying wholly within the casing having their opposite ends secured to the base plate and terminating at the combustion and smoke compartments respectively and extending over the partition.

6. A fire tube boiler comprising a casing arranged above a combustion chamber and a smoke chamber, a nest of vertically disposed inverted U-shaped fire tubes arranged in said casing and having their inlet ends opening into said combustion chamber and their outlet ends opening into said smoke chamber, a vertical partition disposed in said casing and extending upwardly between the inlet and outlet ends of said tubes, said partition dividing the casing into a steam generating compartment and a preheater compartment, and means for feeding water to the preheater compartment, said partition providing communication between said compartments, whereby the water level in the preheater compartment is greater than in the steam generating compartment.

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