May 21, 1929. E. R. WILLIAMS 1,713,729

STEAM OR HOT WATER GENERATOR FOR USE IN HEATING SYSTEMS

Filed April 29, 1926 2 Sheets-Sheet 1

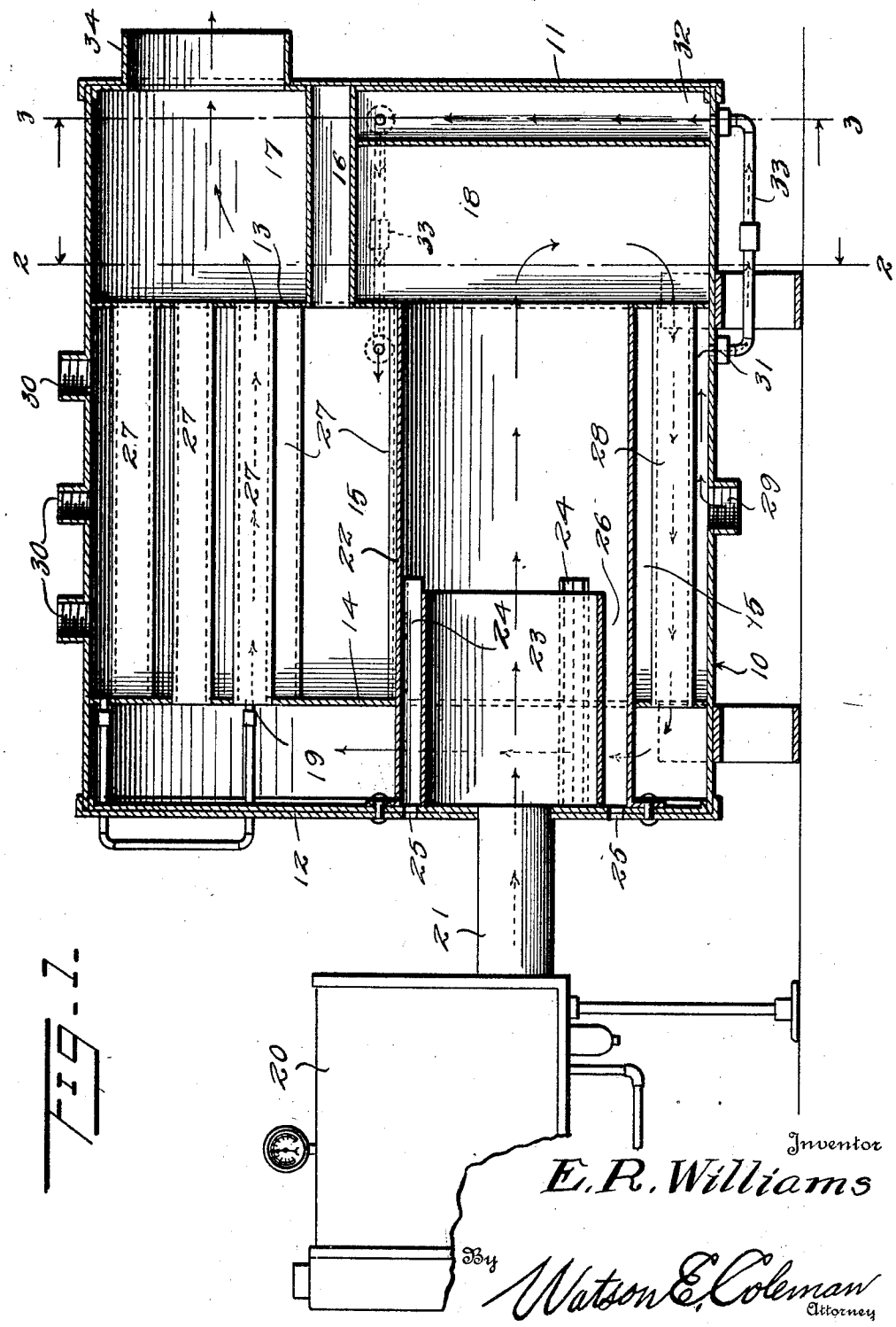

Fig. 1.

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Fig. 2.

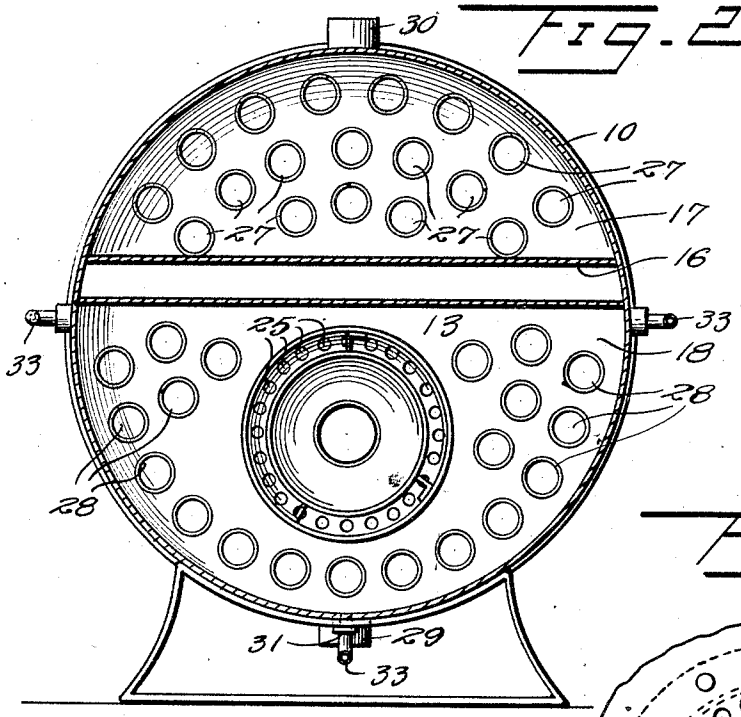


Fig. 4.

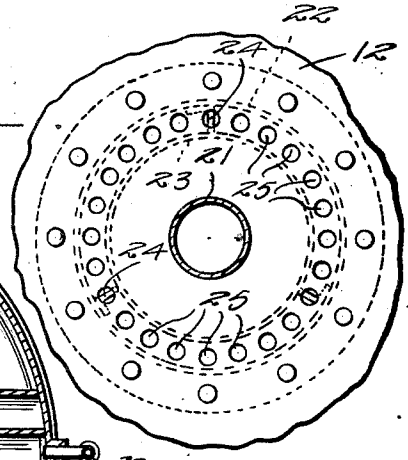
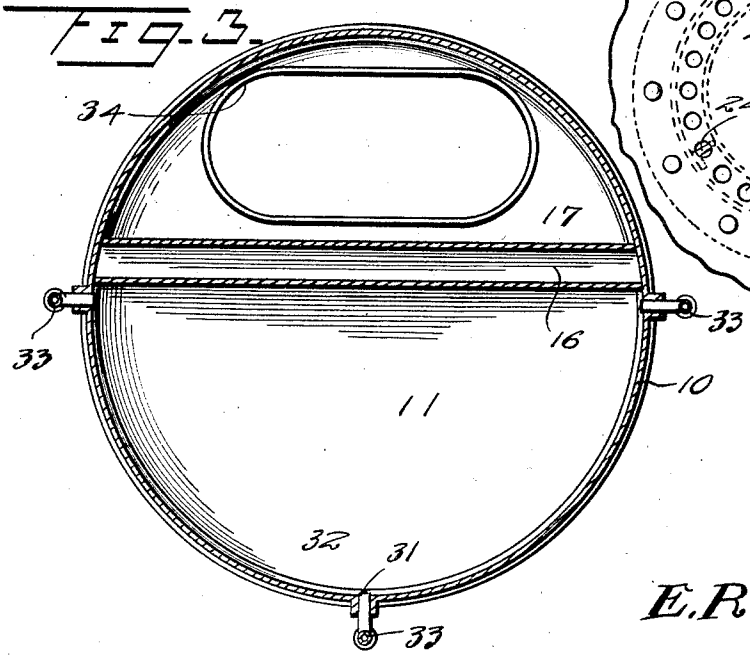


Fig. 3.



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UNITED STATES PATENT OFFICE.

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STEAM OR HOT-WATER GENERATOR FOR USE IN HEATING SYSTEMS.

Application filed April 29, 1926. Serial No. 105,580.

This invention relates to steam or hot water generators for use in heating systems.

An important object of the invention is to produce a boiler, particularly adapted for use with oil or gas burners.

A further object of the invention is to provide a boiler construction which may be readily produced and in which circulation of the products of combustion is such that the maximum heating value of these products is obtained.

A further object of the invention is to provide a device of this character of such construction that burning out of the fire box or walls of the boiler is prevented.

These and other objects I attain by the construction shown in the accompanying drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention and wherein:—

Figure 1 is a longitudinal sectional view through a steam or hot water generator constructed in accordance with my invention;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is a detail fragmentary end elevation showing the manner of admitting air to the combustion chamber.

Referring now more particularly to the drawings, the numeral 10 indicates a cylindrical wall, the ends of which are closed by removable front and rear heads 11 and 12. Between the front and rear walls 11 and 12, front and rear tube sheets 13 and 14 are arranged, providing therebetween a water chamber 15 which is spaced from opposite end walls of the casing. From the front tube sheet 13 a horizontally disposed water bridge 16 extends between the cylindrical walls from the tube sheet to the adjacent end wall 11. This water bridge is in communication with the water chamber 15 and divides the space between the front tube sheet 13 and front wall 11 to an upper smoke box 17 and a lower expansion chamber 18. Between the rear tube sheet 14 and the rear wall of the boiler, a smoke box 19 is formed. The boiler is designed for use with a generator 20 having means for mixing gas or oil with air and discharging the same through a pipe 21 to the boiler. This generator is arranged at the rear of the boiler and a pipe therefrom extends through this rear wall below the level of the water bridge 16. Secured to the inner face of the rear head 12 in concentric relation to the conduit 21 is a cylindrical combustion chamber 22 which extends through the rear tube sheet 14 and opens at its forward end through the front tube sheet 13.

Supported within the rear end of the combustion chamber and abutting with its rear end the rear head 12 is a cylindrical tube 23 of a length slightly greater than the distance between the rear tube sheet 14 and the rear head so that the inner end of this tube is arranged within that portion of the combustion chamber lying within the water chamber 15. This tube is maintained in concentric relation to the combustion chamber by angle iron guides 24 which may be secured either to the combustion chamber wall or to the wall of the tube. The rear head 12 is provided with a plurality of circumferentially spaced openings 25 communicating with the annular space 26 formed between the tube and combustion chamber. The tubes of the tube sheets 13 and 14 are arranged in upper and lower groups, of which the tubes are designated at 27 and 28 respectively. The tubes of the upper group all open at their forward ends into smoke box 17 and at their rear ends into the upper end of the smoke box 19. The tubes 28 are grouped about the combustion chamber and open at their forward ends into the expansion chamber 18 and at their rear ends into the lower end of the smoke box 19.

The water chamber 15 is formed in its bottom wall with an inlet 29 and in its upper wall with an outlet or outlets 30. The lower wall of the water chamber is further provided with an outlet 31 communicating with the lower end of a water wall 32 arranged against the rear face of the front head 11. The upper end of this water wall communicates through conduits 33 with the water chamber 15 at approximately the vertical center thereof.

In the operation of the boiler, as fuel is injected from the generator 20 and enters the combustion chamber 22, after leaving the tube 23, additional air which has been drawn in through the openings 25 is added thereto, preparing the mixture for combustion. Combustion takes place and the products thereof passing from the rear end of the combustion chamber into the expansion chamber 18 are first checked in their movement and then pass through the tubes 28

to the smoke box 19. At this point, they impinge against the outer wall of the combustion chamber and heat this outer wall which, in turn, heats the air passing through the space 26 to the combustion chamber. The products of combustion rising in the smoke box 19 pass through the tubes 27 through the smoke box 17 and so to stack 34. It is pointed out that in the expansion chamber 18, gases serve to heat both the water bridge 16 and water leg 32. This water leg not only serves as a means for speeding up circulation of the boiler, but likewise serves to prevent burning out of the front head 11 by the gases which are at this time very highly heated.

Particular attention is directed to the fact that the gases are caused to pass in opposite directions through the lower oportion of the water chamber in which will be located the cooler portions of the contents, so that a maximum efficiency of these gases is obtained.

Since the construction hereinbefore set forth is capable of a certain range of change and modification without materially departing from the spirit of the invention, I do not limit myself to such specific structure except as hereinafter claimed.

I claim:—

In a boiler, a casing, vertically extending tube sheets spaced from the end walls of the casing and providing at the center of the casing a water space, means horizontally extending from one tube sheet to the adjacent end wall of the casing and subdividing the space between said tube sheet and end wall into an upper smoke box and an expansion chamber, a combustion chamber extending from the opposite end wall of the casing through the water space and opening into said expansion chamber, tubes extending through said water space each communicating at one end with said expansion chamber and at their opposite end with the space between the last named end wall of the casing and the adjacent tube sheet, certain of said tubes being disposed beneath the combustion chamber, other tubes extending through said water space each communicating at one end with said smoke box and at their opposite end with the space between the last named end wall of the casing and the adjacent tube sheet, a tube secured to the last named end wall concentrically with the combustion chamber, said tube being of less diameter than the combustion chamber and of a length greater than the distance between said end wall and the adjacent tube sheet, means for admitting a partially oxygenated fuel charge through said end wall to said tube and openings formed in said end wall between the tube and the wall of the combustion chamber.

In testimony whereof I hereunto affix my signature.

ELMER R. WILLIAMS.