M. J. TRUMBLE.

STEAM BOILER.

APPLICATION FILED FEB. 18, 1919.

1,322,374. Patented Nov. 18, 1919.

Fig. 1.

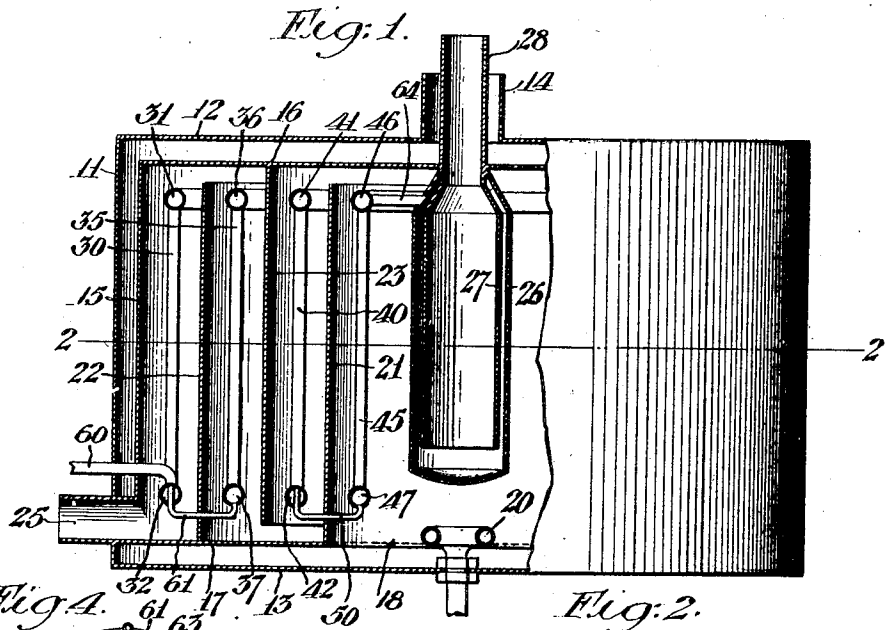


Fig. 4.

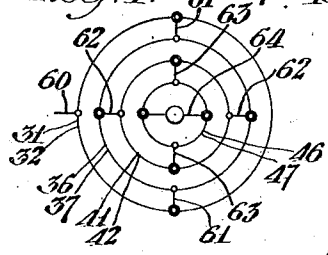


Fig. 2.

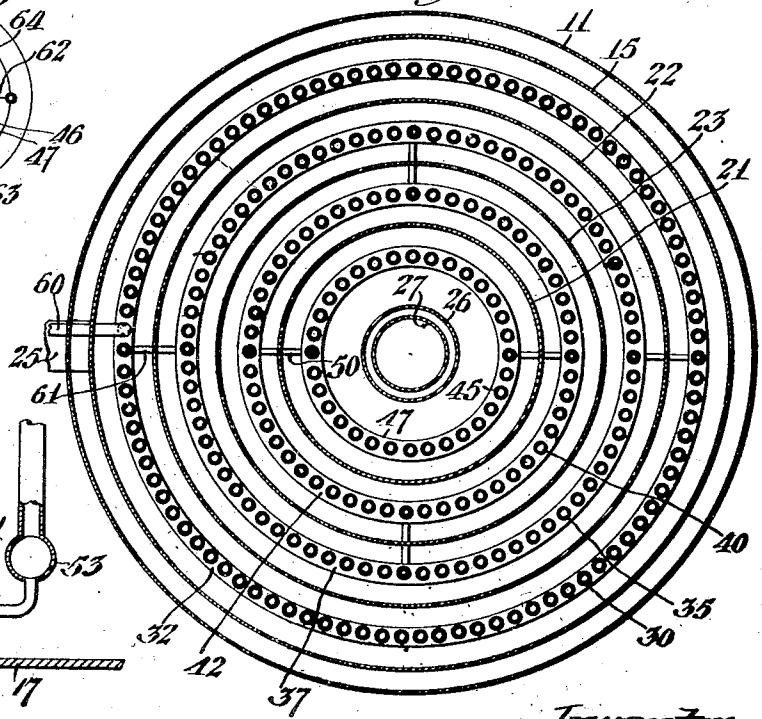
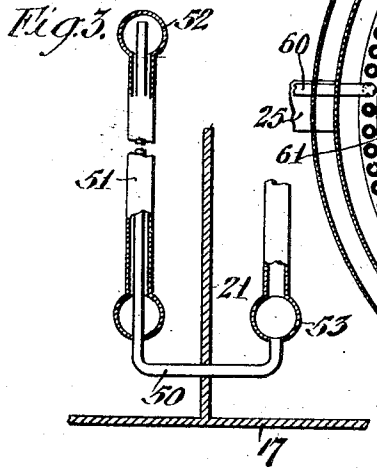


Fig. 3.



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UNITED STATES PATENT OFFICE.

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STEAM-BOILER.

1,322,374. Specification of Letters Patent. Patented Nov. 18, 1919.

Application filed February 18, 1919. Serial No. 277,881.

To all whom it may concern:

Be it known that I, MILON J. TRUMBLE, a citizen of the United States, residing at Alhambra, in the county of Los Angeles and State of California, have invented a new and useful Steam-Boiler, of which the following is a specification.

My invention relates to steam boilers, and the principal object of the invention is to provide a boiler which is especially adapted for use in connection with automobiles or trucks.

Further objects and advantages will be made evident hereinafter.

Referring to the drawings which are for illustrative purposes only,

Figure 1 is an elevation partly in section showing one embodiment of my invention.

Fig. 2 is a section on a plane represented by the line 2—2 of Fig. 1.

Fig. 3 is an enlarged section of the headers and tubes, and

Fig. 4 is a diagram showing the internal connection of the boiler.

In the form of the invention illustrated, a jacket 11 is provided, this jacket having a top 12 and a bottom 13. An inlet cylinder 14 is inserted and secured in a central opening in the top 12 through which the air of combustion for the boiler enters. Located concentrically inside the jacket 11 is a shell 15 which has a tight top 16 and a bottom 17 having a central opening 18 therein. Projecting through the bottom 13 inside the central opening 18 is a burner 20 which may have any convenient form and which may be fed with any suitable type of fuel such as oil or gas.

Secured to the bottom 17 are baffles 21 and 22 and secured to the top 16 is a baffle 23. The space between the baffle 22 and the shell 15 communicates with a flue (not shown) through a tube 25. A central tube 26 is secured in the top 16, having a deflector 27 therein, the interior of this deflector being in open communication with a steam pipe 28 leading to the engine. Located in the space between the shell 15 and the baffle 22 is a series of primary tubes 30 each of which connects into an upper header 31 and a lower header 32. Located between the baffles 22 and 23 is a secondary series of tubes 35 which are each connected into an upper header 36 and a lower header 37. Located between the baffles 21 and 23 is a tertiary set of tubes 40 each of which connect into an upper header 41 and a lower header 42. Located inside the baffle 21 and surrounding the tube 26 is a quartenary set of tubes 45 each of which connect into an upper header 46 and a lower header 47. A plurality of cross over tubes 50 are provided each of which is connected as shown in Fig. 3, each of these tubes extending up through a tube 51 into an upper header 52 and connecting into a lower header 53 of the next series of tubes counting inwardly.

The method of connecting the cross over tubes 50 is shown in Fig. 4. The lower header 32 is connected by a water supply pipe 60 with any source of water supply. The upper header 31 is connected by means of cross over tubes 61 with lower header 37. The upper header 36 is connected through cross over tubes 62 with the lower header 42. The upper header 41 is connected through cross over tubes 63 with the lower header 47, and the upper header 46 is connected through a hot water pipe 64 with the space between the members 26 and 27. The tubes 61, 62 and 63 are similar in construction to the tube 50 illustrated in Fig. 3.

The method of operation is as follows:

Water being admitted through the pipe 60 passes into the lower header 32, upwardly through the tubes 30 into the header 31 and downwardly through the cross over tubes 61 to the lower header 37, passing upwardly through the tubes 35 to the upper header 36, through the cross over tubes 62 to the lower header 42, through the tubes 40 to the upper header 41, from the upper header 41 through the tubes 63 to the lower header 47, through the tubes 45 to the upper header 46 and through the tubes 64 into the space between the members 26 and 27. The already highly heated water is then passed downwardly between the members 26 and 27 in a thin film, the steam produced passing upwardly through the steam pipe 28. The fire from the burner 20 is directly under the member 26 and is in direct contact with the tubes 45. The gases of combustion passing outwardly pass downwardly between the baffles 21 and 22, upwardly between the baffles 22 and 23 and downwardly between the baffles 23 and the shell 15. being finally withdrawn through the tube 25.

It will be seen that the hot liquid rises through the individual tubes 51, the hot liquid being taken off from the extreme top of the headers 52 and delivered to the bot-

tom of any succeeding header 53, the members 50, 51, 52 and 53 being typical of the members numbered from 31 to 64 inclusive and not designating any particular tube or tubes. The water in its passage passes upwardly in the tubes 30, 35, 40 and 45 and passes from the circumference toward the center of the boiler. The hot gases on the other hand pass in a tortuous passage radially outward through the boiler so that the entering water meets the gases of lowest temperature and the steam is produced by direct application of the heat to the member 26 and the tubes 40 and 45.

What I claim is:—

1. A steam boiler comprising walls forming a series of concentric compartments, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connected at one end into one of said upper headers and at the other end into one of said lower headers, a water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, and means for introducing hot gases into the lower portion of the inner most compartment.

2. A steam boiler comprising walls forming a series of concentric compartments, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connected at one end into one of said upper headers and at the other end into one of said lower headers, a water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, a central tube having a tight bottom and centrally located in said innermost compartment, a deflector in said tube, said hot water pipe being connected into said central tube outside said deflector, a steam pipe connected to said central tube, and means for introducing hot gases into the lower portion of the innermost compartment.

3. A steam boiler comprising walls forming a series of concentric compartments, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connected at one end into one of said upper headers and at the other end into one of said lower headers, a water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, each of said cross over tubes passing through one of said water tubes into the upper header into which said water tube connects, and means for introducing hot gases into the lower portion of the innermost compartment.

4. A steam boiler comprising walls forming a series of concentric compartments, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connected at one end into one of said upper headers and at the other end into one of said lower headers, a water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, each of said cross over tubes passing through one of said water tubes into the upper header into which said water tube connects, a central tube having a tight bottom and centrally located in said innermost compartment, a deflector in said tube, said hot water pipe being connected into said central tube outside said deflector, a steam pipe connected to said central tube, and means for introducing hot gases into the lower portion of the innermost compartment.

5. A steam boiler comprising walls forming a series of concentric compartments, a jacket surrounding said walls to form a preheating space through which the air of combustion is drawn, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connected at one end into one of said upper headers and at the other end into one of said lower headers, a water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, and means for introducing hot gases into the lower portion of the innermost compartment.

6. A steam boiler comprising walls forming a series of concentric compartments, a jacket surrounding said walls to form a preheating space through which the air of combustion is drawn, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connected at one end into one of said upper headers and at the other end into one of said lower headers, a

water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, a central tube having a tight bottom and centrally located in said innermost comparment, a deflector in said tube, said hot water pipe being connected into said central tube outside said deflector, a steam pipe connected to said central tube, and means for introducing hot gases into the lower portion of the innermost compartment.

7. A steam boiler comprising walls forming a series of concentric compartments, a jacket surrounding said walls to form a preheating space through which the air of combustion is drawn, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connected at one end into one of said upper headers and at the other end into one of said lower headers, a water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, each of said cross over tubes passing through one of said water tubes into the upper header into which said water tube connects, and means for introducing hot gates into the lower portion of the innermost compartment.

8. A steam boiler comprising walls forming a series of concentric compartments, a jacket surrounding said walls to form a preheating space through which the air of combustion is drawn, an upper header in each compartment, a lower header in each compartment, a series of water tubes in each compartment each tube connec ed at one end into one of said upper headers and at the other end into one of said low :r headers, a water supply pipe connected into the lower header of the outer compartment, a hot water pipe connected into the upper header of the innermost compartment, cross over pipes connecting each of said upper headers except the innermost with the lower header in the next inner compartment, each of said cross over tubes passing through one of said water tubes into the upper header into which said water tube connects, a central tube having a tight bottom and centrally located in said innermost compartment, a deflector in said tube, said hot water pipe being connected into said central tube outside said deflector, a steam pipe connected to said central tube, and means for introducing hot gases into the lower portion of the innermost compartment.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 10th day of February, 1919.

MILON J. TRUMBLE.