May 10, 1927. 1,627,668

M. ROBBINS

STEAM GENERATOR

Filed Jan. 23, 1924 2 Sheets-Sheet 1

Fig. 1

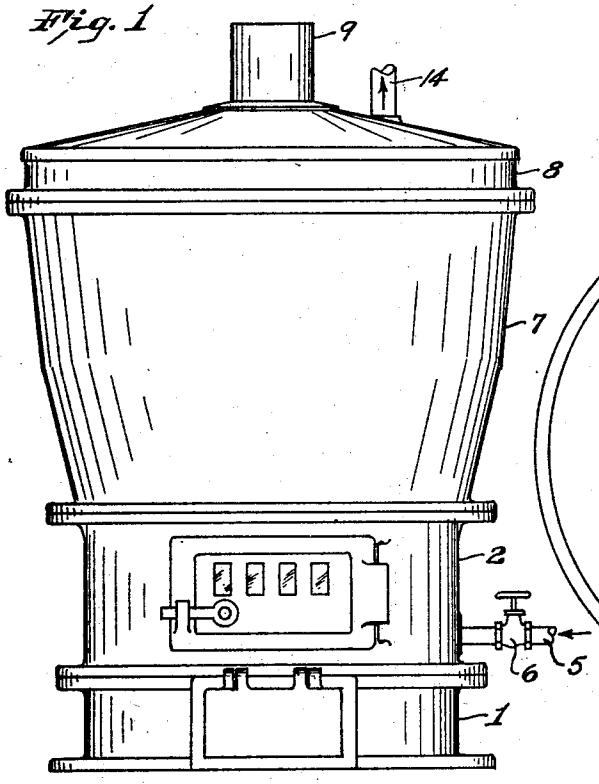


Fig. 2.

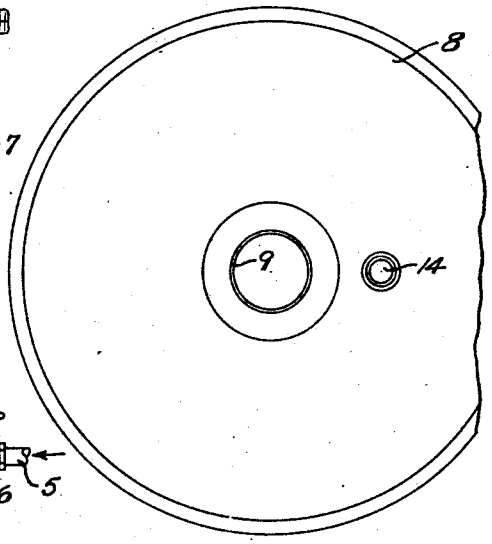
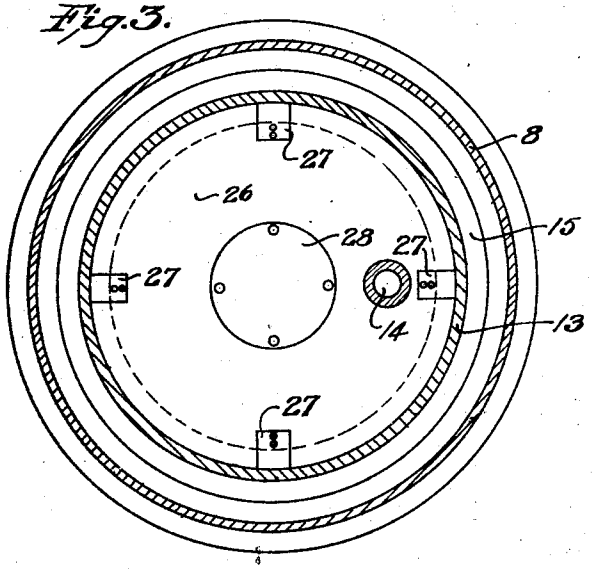


Fig. 3.



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Fig. 4.

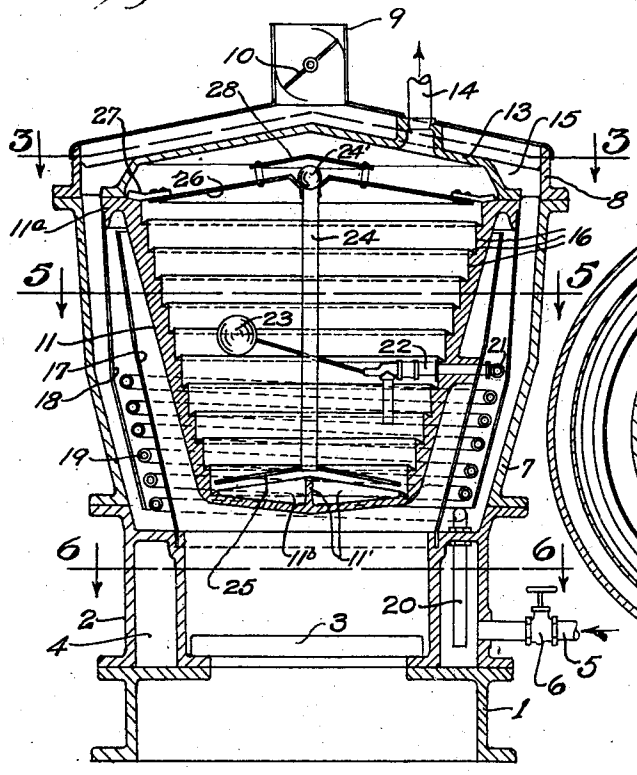


Fig. 5.

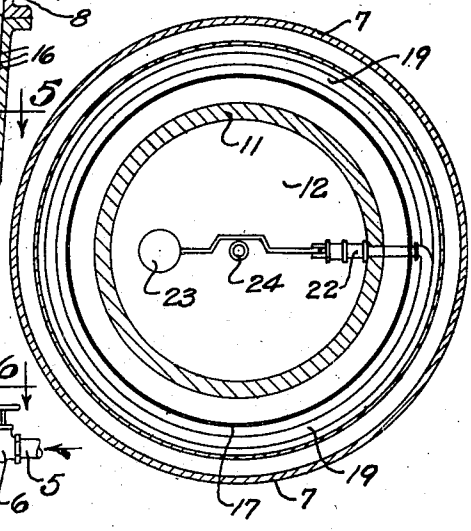
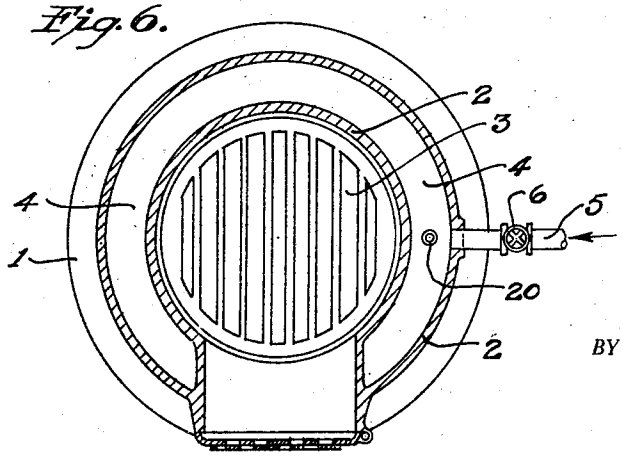


Fig. 6.



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Patented May 10, 1927. 1,627,668

UNITED STATES PATENT OFFICE.

MEYER ROBBINS, OF MALDEN, MASSACHUSETTS.

STEAM GENERATOR.

Application filed January 23, 1924. Serial No. 687,957.

This invention relates to steam generators and consists in the novel construction, combination and relation of parts described and illustrated in the accompanying specification and drawings and particularly pointed out in the appended claims.

My generator is particularly designed for household heating purposes, and accordingly I shall discuss it from this point of view in the present application, although it will be understood that such treatment is purely illustrative and in no way limiting.

In such a generator, it is essential that the required head of steam not only be quickly and economically generated, but that the apparatus shall be automatic in action and wholly safe and reliable in use.

To the end, therefore, of providing a steam generator which will satisfactorily combine these characteristics in a simple and economically operating form, I have devised my present invention. In it, the water to be vaporized is subjected to an initial preheating before delivery to the steam chamber of the generator, thus increasing the rapidity of vaporization. When delivered into the steam chamber, therefore, the water is at a temperature at which it can be quickly vaporized. This chamber is located directly over the firebox of the apparatus and the bottom thereof is provided with a plurality of radially extending spaced ribs which divide the water and assist in rapidly bringing it to the point of ebullition. From the boiler compartment thus provided, the water is caused to traverse the steam chamber from end to end thereof in alternately opposite directions whereby to insure complete vaporization thereof. Preferably the steam chamber is of inverted frustro-conical form and the inner face of its side wall is circumferentially corrugated or otherwise roughened to provide a series of annular ribs of progressively increasing diameter from bottom to top thereof over which the water spreads in a thin extended film best suited for immediate vaporization.

As illustrative of the principles of my invention, I shall show and describe herein a form which has been found satisfactory in use and well adapted to the requirements of manufacture.

In the drawings:—

Fig. 1 is a front elevation of a steam generator in accordance with my invention;

Fig. 2 is a fragmentary plan view thereof;

Fig. 3 is a transverse section on the line 3—3 of Fig. 4;

Fig. 4 is a vertical section through the generator; and

Figs. 5 and 6 are transverse sections on the lines 5—5 and 6—6 respectively of Fig. 4.

I have indicated at 1 the ash pit section of a steam generator in accordance with my invention, and at 2 the firebox section thereof, which section surmounts the section 1 and contains the usual grate 3.

The firebox section 2 is water-jacketed as indicated at 4, a water supply pipe 5 valved as at 6 is tapped into said water jacket.

Surmounting the firebox section 2 is a generator section 7 which includes a top section 8 having a flue connection 9 provided with a suitable damper 10.

Supported upon suitable lugs within the section 7 and spaced therefrom as shown in Fig. 4 is an inverted frusto-conical shell 11 defining a steam chamber 12 located directly over the firebox. The shell 11 is open at its top and closed at its bottom and is provided with a surmounting cover 13 having a steam outlet pipe 14 rising therefrom through the covered top section 8, the space between said covers 8 and 13 providing a passage 15 for the escape of the flue gases. The closed bottom of the shell 11 is provided with a plurality of spaced, radially extending ribs 11^1, and the inner face of the shell wall is circumferentially corrugated or otherwise roughened as indicated at 16, to provide a series of annular ribs of progressively increasing diameter from bottom to top thereof over which the water within said shell spreads in a thin extended film best suited for immediate vaporization.

Mounted within the surrounding annular space between the shell 11 and section 7 is a pair of spaced enclosing shells 17 and 18 between which is arranged a pre-heater coil 19 for pre-heating the water delivered into the steam chamber. The shell 17 rises from the firebox section 2 and the shell 18 depends from the flanged upper end 11^a of the shell 11. The upper edge of the shell 17 terminates short of the flange 11^a and the lower edge of the shell 18 terminates short of the firebox section 2 whereby to permit a free circulation of heat about the shell 11 and

between said shells 17 and 18 to the coil 19.

The intake end 20 of the coil 19 depends into the water-jacket 4 and the delivery end of said coil connects at 21 with a pipe 22 discharging downwardly into the steam chamber 12, as indicated in Fig. 4. Located in the pipe 22 is a suitable regulating valve operated by a float 23 to automatically admit more water whenever the water level in said steam chamber drops below a predetermined point.

Axially mounted within the steam chamber 12 is a tube 24 into which the water enters from below as the pressure within said chamber increases. At its lower end, the tube 24 is supported above and spaced from the closed bottom of the shell 11 by a deflector 25 which overlies the ribs 11^1 of the shell bottom and defines therewith a boiler compartment 11^b in which the water is boiled as it descends thereinto past the perimeter of the deflector. The deflector itself slopes upwardly from its perimeter towards its center so as to direct the water within said boiler compartment into the lower end of said tube 24. At its upper end, the tube 24 is carried through a similar deflector 26 supported upon a series of spaced lugs 27 projecting inwardly from the shell 11.

Closing the upper end of the tube 24 beyond said deflector 26 is a vacuum ball check valve 24^1 which is adapted to be unseated by the rising column of water in said tube as the pressure increases to thereby permit the water to escape downwardly over the sloping deflector 26 and back into the shell 11 through the space between the perimeter of said deflector and the shell. The ball check 24^1 is confined against permanent displacement relative to its seat upon the upper end of said tube by an overlying cage 28 mounted upon the deflector 26 and spaced therefrom.

In operation water is admitted into the water-jacket 4 from pipe 5 and enters the pre-heater coil 19 for preheating before delivery into the steam chamber 12 through pipe 22. The water collects in the boiler compartment 11^b and is rapidly heated due to the ribbed formation of the chamber bottom and to the proximity thereof to the fire-box, and is directed by the upwardly sloping deflector 25 into the lower end of the tube 24. As the pressure increases, the column of water rises in said tube, after the manner of a percolator, unseating the ball check 24^1 and flowing downwardly along the sloping surface of the deflector 26 and back into the shell 11, being spread out over the stepped corrugations 16 thereof in a thin, readily vaporized film. The steam rises upwardly within said shell past the deflector 26 and out through pipe 14 for service to the various feeder pipes of the heating system.

After the generator has been in action for some time, the corrugated side wall of the shell 11 becomes very hot so that the water in contact therewith will be immediately vaporized and steam formed. The main supply of steam is therefore formed by contact of the water with the upper portion of the side wall of the shell.

Various modifications in the construction and arrangement of parts may obviously be resorted to within the limits of the appended claims.

Having thus described my invention in detail, what I claim as new is:

1. A steam generator comprising a water-jacketed fire box section, and an outside casing having a flue connection, an inverted frusto-conical shell mounted within and spaced from said casing and having a closed bottom disposed directly over the fire-box and a cover provided with a steam outlet, said shell and cover constituting a steam chamber, a pair of spaced shells disposed within the space separating said steam chamber shell from the casing and defining with said parts an upwardly and downwardly directed passage for the circulation of heat from the fire-box, a pre-heating coil disposed in the space between said pair of heat circulating shells and connecting at one end with said water jacket of the fire-box section and at its other end delivering into said steam chamber shell, a float regulating the passage of water from said coil into said shell, and a tube arranged axially within said shell, a vacuum check valve closing the upper end of said pipe, and deflectors at either end of said pipe for directing the water into said pipe from below and downwardly back into the shell from above whereby the water is given a traversing movement of the shell alternately in opposite directions.

2. A steam generator comprising a water-jacketed fire-box section, and an outside casing having a flue connection, an inverted frusto-conical shell mounted within and spaced from said casing and having a closed bottom disposed directly over the fire-box and a cover provided with a steam outlet, said shell and cover constituting a steam chamber and the inner face of the shell wall being corrugated from top to bottom to provide a series of expansion surfaces of progressively increasing diameter upwardly of the shell, over which the water spreads in a thin extended film, a pair of spaced shells disposed within the space separating said steam chamber shell from the casing and defining with said parts an upwardly and downwardly directed passage for the circulation of heat from the fire-box, a pre-heating coil disposed in the space between said pair of heat circulating shells and connecting at one end with said water jacket of the fire-box section and at its other end delivering into said steam chamber shell, and a float

regulating the passage of water from said coil into said shell, the bottom of said shell being formed with a plurality of radially disposed spaced ribs constituting a boiler section.

3. A steam generator comprising a water-jacketed fire box section, and an outside casing having a flue connection, an inverted frusto-conical shell mounted within and spaced from said casing and having a closed bottom disposed directly over the fire-box and a cover provided with a steam outlet, said shell and cover constituting a steam chamber and the inner face of the shell wall being corrugated from top to bottom to provide a series of annular ribs progressively increasing diameter upwardly of the shell over which the water spreads in a thin extended film, a pair of spaced shells disposed within the space separating said steam chamber shell from the casing and defining with said parts an upwardly and downwardly directed passage for the circulation of heat from the fire-box, a pre-heating coil disposed in the space between said pair of heat circulating shells and connecting at one end with said water jacket of the fire-box section and at its other end delivering into said steam chamber shell, a float regulating the passage of water from said coil into said shell, a tube arranged longitudinally within said shell, a vacuum check valve closing the upper end of said pipe, and deflectors at either end of said pipe for directing the water into said pipe from below and downwardly over the corrugations of said shell from above whereby the water is given a traversing movement of the shell alternately in opposite directions, the bottom of said shell being formed with a plurality of radially disposed spaced ribs constituting with the lower deflector a boiler section disposed immediately below the open end of said pipe and immediately above the fire-box.

4. A steam generator, comprising a water-jacketed fire box section and an outside casing having a flue connection, a shell mounted within and spaced from said casing and having a closed bottom disposed directly over the fire-box and a cover provided with a steam outlet, said shell and cover constituting a steam chamber, a pair of spaced shells disposed within the space separating said steam chamber shell from the casing and defining with said parts an upwardly and downwardly directed passage for the circulation of heat from the fire-box, and a pre-heating coil disposed within the space between said pair of heat circulating shells and connecting at one end with said water jacket of the fire-box section and at its other end delivering into said steam chamber shell.

5. A steam generator, comprising a water-jacketed fire box section and an outside casing having a flue connection, a shell mounted within and spaced from said casing and having a closed bottom disposed directly over the fire-box and a cover provided with a steam outlet, said shell and cover constituting a steam chamber, a pair of spaced shells disposed within the space separating said steam chamber shell from the casing and defining with said parts an upwardly and downwardly directed passage for the circulation of heat from the fire-box, and a pre-heating coil disposed within the space between said pair of heat circulating shells and connecting at one end with said water jacket of the fire-box section and at its other end delivering into said steam chamber shell, the bottom of said steam chamber shell being formed with a plurality of radially disposed ribs constituting a boiler section disposed immediately above the fire-box.

In testimony whereof, I hereunto affix my signature this seventeenth day of January, 1924.

MEYER ROBBINS.