Oct. 1, 1940. L. W. JEFFORDS 2,216,369

DRY STEAM GENERATOR

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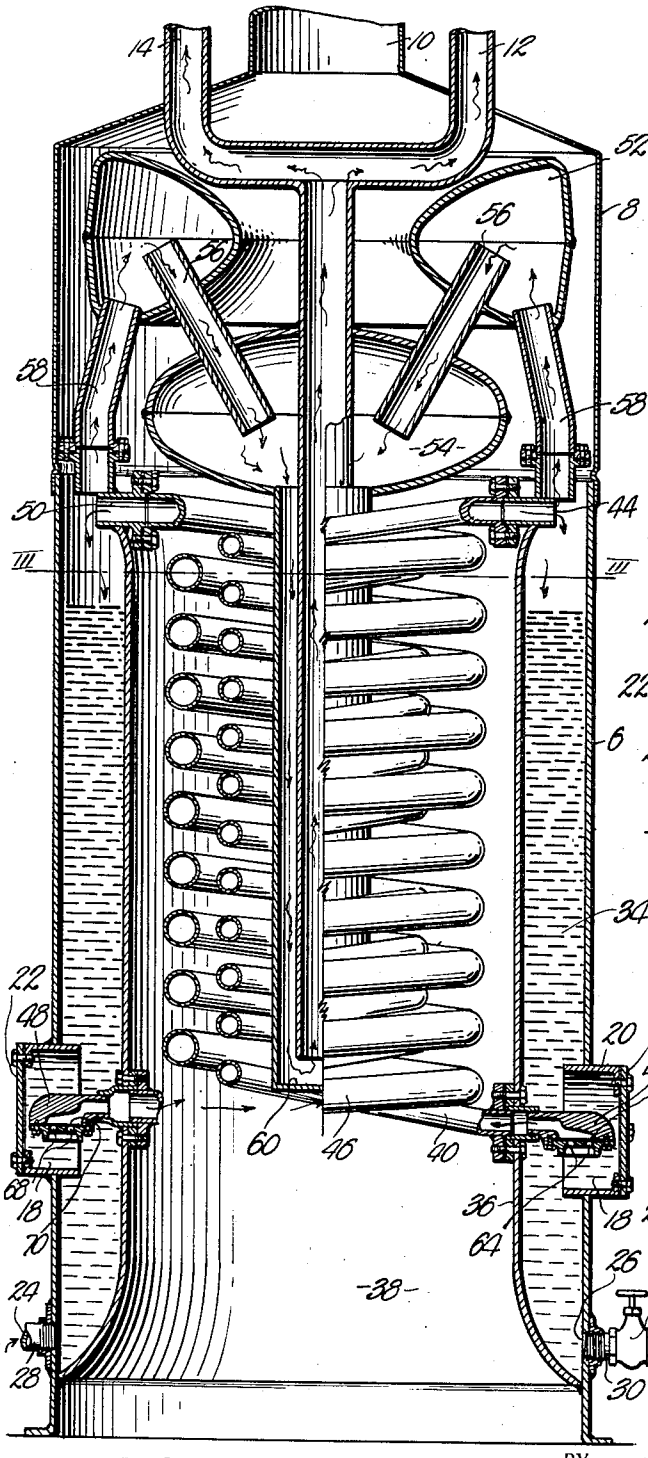


Fig. 2.

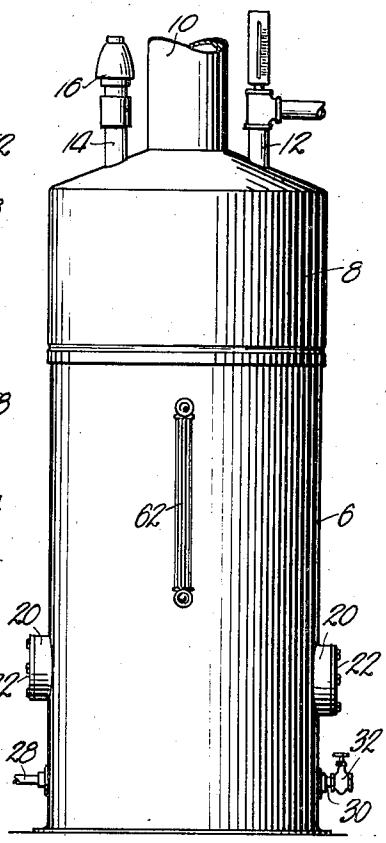


Fig. 1.

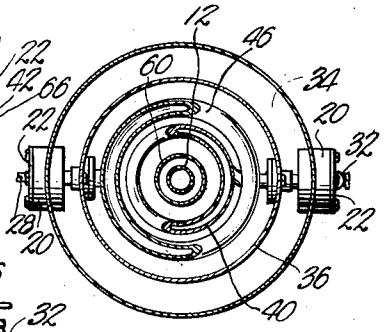


Fig. 3.

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DRY STEAM GENERATOR

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3 Claims. (Cl. 122—169)

This invention relates to steam generating equipment and particularly a generator for dry steam having as a portion thereof, a coiled pipe serving as a quick vaporizing unit, the production of steam wherein is produced periodically at a rapid rate of speed and in such fashion as to cause water in the pipe to absorb all of the heat units in contact with the outer surface of the pipe when a charge of water is introduced thereto.

One of the important aims of the instant invention is to provide a dry steam generator having means whereby the speed of circulation of water and steam through the generator is altered in accordance with the temperatures in the heater compartment.

Another important object of this invention is to provide a dry steam generator of the aforementioned type wherein the water is positively circulated in an automatic manner without the use of objectionable mechanical elements and through the employment of parts which will not get out of order and which are disposed in a place where the temperature is maintained at a relatively low degree, so that destructive action cannot be exerted thereon.

A still further object of this invention is to provide a steam generator having specially disposed super-heating chambers, all of which are interconnected in a way as to efficiently utilize the heat units passing upwardly through a special heater compartment; the said super-heating chambers being joined to a coil steam generating pipe in a way which will permit the return of water to a point where it may be reintroduced into said steam generating pipe without the necessity of entering the super-heating chambers.

Other objects of the invention will appear during the course of the following specification, referring to the accompanying drawing wherein:

Figure 1 is a side elevational view of a dry steam generator made in accordance with the present invention.

Fig. 2 is an enlarged vertical central sectional view through the generator; and,

Fig. 3 is a cross sectional view through the same, taken on line III—III of Fig. 2.

The numeral 6 designates a tank which is preferably cylindrical in form and having its longitudinal axis disposed vertically. The upper end of tank 6 has a removable cap section 8 thereon from which extends a flue 10 and through which passes a take-off conduit 12 and a branch 14 therefrom on the upper end of which is mounted a pop-off valve 16.

Work openings 18 in tank 6 have flanged collars 20 thereon on the outer edges of which are secured cover plates 22 so that access to the parts of the generator adjacent thereto is possible.

The lower end of tank 6 has an intake port 24 and a drain opening 26 created therein, to which may be secured pipes 28 and 30 respectively. A conventional drain cock 32 carried by pipe 30 controls the opening and closing of opening port 26 so that water reservoir 34 may be cleaned or freed of water.

An annular partition 36 mounted in tank 6 is concentric with the latter and smaller in diameter so that the annular reservoir 34 is of a circumscribing nature with respect to the heater compartment 38 formed in the bottom portion of tank 6. This heater compartment may be in the nature of a fire box and may contain a gas or oil burner to the end that any type of fuel may be employed in operating the generator.

In the instance illustrated, two coils of pipes comprise the vaporizing unit. Pipe 40 has its lower end in communication with reservoir 34 through the medium of a specially formed valve 42, while the upper end thereof communicates with reservoir 34 as at 44. Another pipe 46 communicates with reservoir 34 through the medium of another valve 48 that is identical with previously mentioned valve 42. The upper or opposite end of pipe 46 communicates with reservoir 34 as at 50.

A series of super-heating chambers at the upper end of tank 6 and within section 8 thereof, are specially formed and disposed so that the steam will follow the paths of travel indicated by the arrows.

A primary super-heater 52 is annular in form and uppermost in position. It circumscribes the longitudinal axis and is joined to the secondary super-heating chamber 54 by a plurality of tubes 56. Tubes 56 extend upwardly into primary heater 52 so that in the event condensate should form it will not pass into secondary super-heating chamber 54, but will drain back into reservoir 34 through tubes 58, the upper ends of which are in communication with primary super-heater 52. The lower ends of these tubes 58 enter the upper portion of reservoir 34 as shown.

The secondary super-heating chamber 54 is centrally located and of a diameter great enough to overlie coiled pipes 40 and 46.

An elongated hollow member 60 extends downwardly from super-heating chamber 54 on the axis of the generator and terminates in a closed end near the bottom of the vaporizing unit, comprising coiled pipes 40 and 46. It is from this

elongated hollow member 60 that the steam passes to take-off tube 12, the lower end of which is adjacent to the closed end of member 60, whereby take-off tube 12 is practically fully telescoped into member 60. The relative diameters of tube 12 and member 60 is such that a space between the telescoped parts is ample to allow the quick passage of super-heated steam.

The form of secondary super-heating chamber 54 is such as to direct the upwardly passing heat against annular super-heating chamber 52, i. e. the bottom of chamber 54 is inclined upwardly and outwardly from the axis of said tank to so direct the heat toward member 52.

The level of water within reservoir 34 may be visualized through the employment of a conventional sight gauge 62, secured to tank 6.

The manner of joining together the parts is amply illustrated in Fig. 2 to teach one skilled in the art that the generator may be assembled and taken part with a minimum amount of trouble so that replacements may speedily be made.

Valves 42 and 48 located in reservoir 34, are so positioned as to be cooled by the water at all times. The intake openings 64 of valve 42, for example, are directed downwardly and a flap 66 overlies opening 64 when water is not being drawn into pipe 40 from reservoir 34. Likewise, intake openings 68 of valve 48 are covered by a flap 70 which is closed to preclude water passing into pipe 46 from reservoir 34.

The operation of a dry steam generator embodying the concepts of this invention is peculiarly distinctive and the results obtained through the simple structure, above set down, render the generator highly efficient and most desirable.

The lower ends of pipes 40 and 46 must be in communication with reservoir 34 below the water line, and the upper ends of these pipes must be joined to reservoir 34 above the water line during the operation of the generator. When heat is produced in heater compartment 38, water in pipes 40 and 46 is instantly converted to steam. Obviously, this steam is generated in the portions of pipes 40 and 46 closest to the source of heat and as soon as this steam is created, an eruption takes place within the pipes which drives the steam and water content thereof, upwardly and out the ends above the water line. The water in these pipes will return through connections 44 and 50 to reservoir 30, while the steam will escape upwardly through tubes 58 into first the primary super-heater 52 and thence to the take-off tube 12 through chambers 54 and 60. The inertia of the water and steam carries the same out of pipes 40 and 46 as soon as steam in the lower part of these pipes establishes the upward movement. A partial vacuum is formed in the lower parts of pipes 40 and 46 and a new supply of water from reservoir 34 is drawn into the coiler pipes, a portion of which is instantly converted into steam to cause another eruption and another unloading of the pipes.

Flaps 66 and 70, as the case may be, operate to preclude the passage of formed steam back into reservoir 34, and so long as there is heat in heater compartment 38, the pulsating cycles will occur.

As the steam passes through the interconnected super-heating chambers, it will be quickly and positively super-heated without raising the pressure, thus super-heated steam for low pressure purposes is generated through the use of equipment, the safety of which, due to its nature, cannot be questioned.

Obviously, generators having physical characteristics other than those illustrated and described may be made without departing from the spirit of the invention and scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A steam generator of the character described comprising a cylindrical tank having its longitudinal axis disposed vertically and provided with a flue at its upper end and a heater compartment at the lower end thereof; an annular partition within the tank in spaced relation to the wall thereof to set off a water reservoir that circumscribes the heater compartment; a spirally coiled pipe in the heater compartment having the ends thereof in communication with the reservoir, one end of said pipe being below the normal water line of the reservoir, the other end being above said water line; a valve at the first mentioned end of said pipe permitting flow of liquid only into said pipe from the reservoir; an annular super-heating chamber at the top of said tank having intake tubes for receiving steam from the coiled pipe; a second super-heating chamber below the said annular super-heating chamber; tubes interconnecting the said chambers; and a take-off conduit in connection with the second super-heating chamber, said tubes extending upwardly into the annular super-heating chamber to provide means for precluding the flow of condensate therethrough into the second super-heating chamber.

2. A steam generator of the character described comprising a cylindrical tank having its longitudinal axis disposed vertically and provided with a flue at its upper end and a heater compartment at the lower end thereof; an annular partition within the tank in spaced relation to the wall thereof to set off a water reservoir that circumscribes the heater compartment; a spirally coiled pipe in the heater compartment having the ends thereof in communication with the reservoir, one end of said pipe being below the normal water line of the reservoir, the other end being above said water line; a valve at the first mentioned end of said pipe permitting flow of liquid only into said pipe from the reservoir; an annular super-heating chamber at the top of said tank having intake tubes for receiving steam from the coiled pipe; a second super-heating chamber below the said annular super-heating chamber; tubes interconnecting the said chambers; and a take-off conduit in connection with the second super-heating chamber, the wall of said second super-heating chamber being inclined upwardly and outwardly from the axis of said tank to direct heat toward the overlying annular super-heating chamber.

3. A steam generator of the character described comprising a cylindrical tank having its longitudinal axis disposed vertically and provided with a flue at its upper end and a heater compartment at the lower end thereof; an annular partition within the tank in spaced relation to the wall thereof to set off a water reservoir that circumscribes the heater compartment; a spirally coiled pipe in the heater compartment having the ends thereof in communication with the reservoir, one end of said pipe being below the normal water line of the reservoir, the other end being above said water line; a valve at the first mentioned end of said pipe

permitting flow of liquid only into said pipe from the reservoir; an annular super-heating chamber at the top of said tank having intake tubes for receiving steam from the coiled pipe; a second super-heating chamber below the said annular super-heating chamber; tubes interconnecting the said chambers; and a take-off conduit in connection with the second super-heating chamber, said second super-heating chamber having an elongated hollow member extending downwardly therefrom on the axis of said tank, said take-off conduit extending through the second super-heating chamber and into the said elongated hollow member.

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