

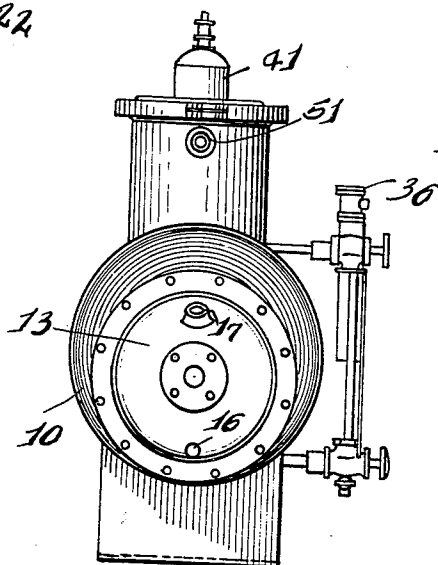
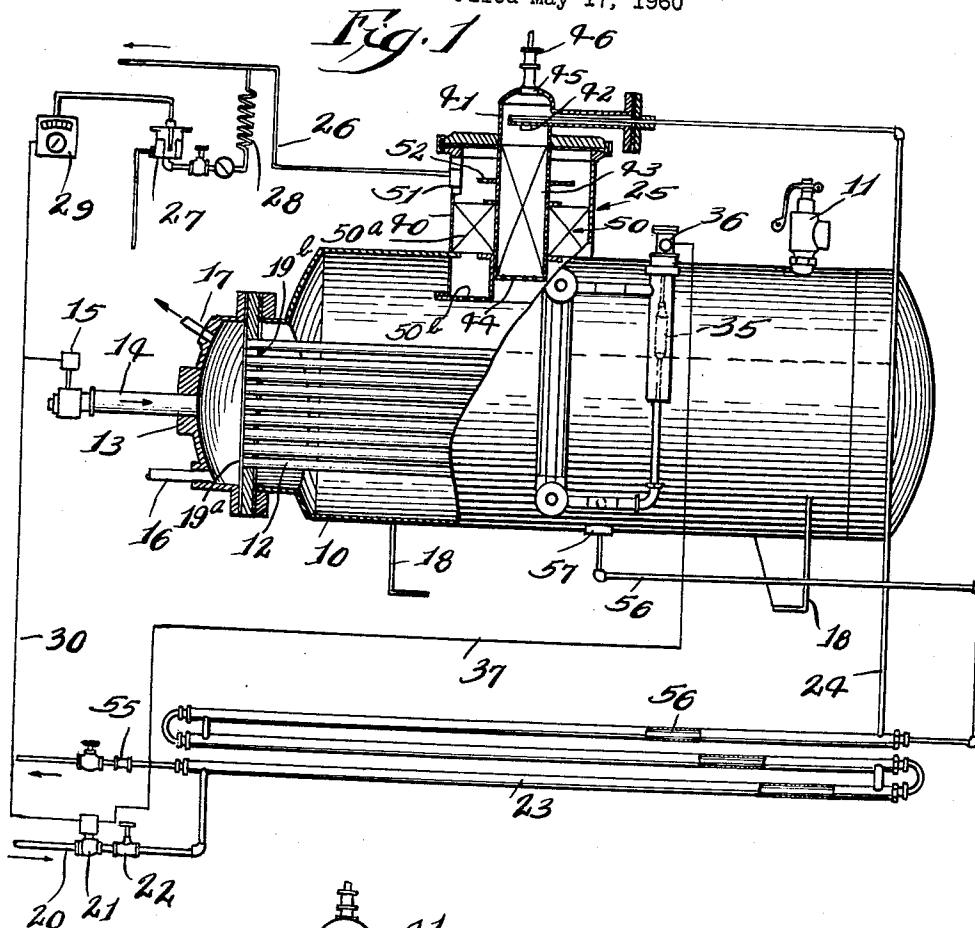
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STEAM GENERATOR

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STEAM GENERATOR

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4 Claims. (Cl. 55—185)

This invention relates to a steam generator and, more particularly, to a sanitary steam generator in which steam of extremely high purity, free of dissolved gases and volatile constituents, is produced.

An object of this invention is to provide a new and improved steam generator.

Another object of this invention is to provide a sanitary steam generator in which continuous blowdown is obtained from the evaporator shell, in which the steam is sampled and the salinity thereof is checked with an indication when the salinity exceeds a predetermined value along with shutdown of the generator and new and improved feed water deaeration and steam demisting.

Another object of the invention is to provide a steam generator having a combination feed water deaerator and steam demister provided with a common wall whereby steam generated functions to heat the incoming feed water and steam caused to condense on the common wall is directed through the steam demister to obtain washing thereof as well as improving operation of the demister.

Further objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a vertical view of the steam generator with parts broken away; and

FIG. 2 is an end elevational view of the evaporator shell for the steam generator.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

The need for pure steam is one which is growing continuously particularly in food processing industries and in connection with the treatment of dairy products for germicidal or bactericidal purposes. Steam produced by the ordinary steam boiler contains volatile boiler compounds, boiler water entrainment, scale from steam pipelines, gases and other matter dissolved in the boiler feed water. Thus the steam produced is far from pure and is quite unsuitable for the purposes mentioned above. According to the present invention, however, there is provided an evaporator for producing pure steam, that is, steam devoid of the contaminants mentioned above. For this purpose there is provided an evaporator with a steam coil which boils relatively clean city water using the boiler steam as a heat source. By the addition of a deaerator and demister for treating the feed water as it enters the evaporator and the steam as it leaves the evaporator, volatile compounds and entrained water are removed; and by providing blowdown, the solids accumulation in the feed water is reduced. To the foregoing indicated structure, means may be added for detecting the salinity of the steam delivered by the evaporator which means in turn may be coupled with means for automatically shutting down the apparatus should the salinity exceed a predetermined value.

Substantially all of the foregoing can be integrated into the evaporator shell thus producing a unitary vessel of more efficient configuration.

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Turning now to the specific embodiment of the invention illustrated in the drawings, there is shown an evaporator shell 10 having a relief valve 11 and a bundle of U-shaped heating coils 12 which communicate with a fitting 13 at one end of the shell having an inlet pipe 14 for heating steam or other heating material controlled by a solenoid valve 15. The heating coils or tubes 12 open at one end to a tube sheet 19a. The fitting 13 has a condensate outlet 16 and a vent opening 17. A leg structure 18 provides for mounting of the evaporator shell on a suitable support.

Heating steam admitted through the pipe 14 and fitting 13 enters one open end of the heating coils or tubes 12, the other end of which tubes terminates at tube sheet 19b, and the space between the two tube sheets is in communication with an exhaust for the steam.

Feed water is supplied to the evaporator shell 10 from an inlet line 20 having a solenoid control valve 21 as well as a manual valve 22 with the feed water traveling through a blowdown cooler in the form of a pipe bundle 23. The feed water then travels from the cooler through a pipe 24 to a combination deaerator and demister unit indicated generally at 25.

Sanitary steam leaves the evaporator shell from the combination deaerator-demister unit 25 through a line 26 and salinity of the steam is checked by a conductive type cell 27 which receives condensed steam issuing from a condenser 28 and which is connected to a salinity control unit 29. The unit has means for producing an alarm signal when the salinity exceeds a predetermined value and which also, through an electrical line 30, operates the solenoid valve 21 controlling the feed water supply and the solenoid valve 15 controlling the heating steam supply to shut down the unit.

The level of feed water within the evaporator shell 10 is normally maintained at a level above the heating coil bundle 12 as determined by a float 35 mounted within piping external of the evaporator shell 10 and connected to a float-operated switch 36 which through an electric line 37 also connects into the feed water solenoid control valve 21.

The combination deaerator and demister unit 25 embodies a casing 40 mounted on the evaporator shell 10 and extending within an opening in the wall thereof and has a central column defining a feed water deaerating section with this column being identified at 41 and in the form of a tubular member. The outlet end of the feed water pipe 24 terminates within this column and has a spray nozzle 42 to spray feed water downwardly to a deaerating packing 43 with the water passing through this packing and a grating 44 into the evaporator shell. The deaerator packing 43 consists of contact material commonly used in a packed column such as ceramic rings. The upper end of the deaerator column is provided with a vent 45 and an orifice 46 is in the outlet line leading from the vent whereby air and other dissolved gases drawn off from the feed water may be vented.

The combination unit 25 also embodies a demister section for the steam indicated generally at 50 which surrounds the deaerator column 41 and which has a conventional packing 50a disposed therein whereby steam passing upwardly through grating 50b from the unit 25 passes through the packing 50a and to an outlet 51 connected to the outlet pipe 26. A portion of the steam generated within the evaporator shell passes upwardly through the column 41 and outwardly through the vent 45, thereby assisting in the removal of air from the column 41 and the steam passing through the demister section 50 heats the feed water within the column. In order to improve operation of the demister 50 an annular ring 52 is mounted on the outside of the wall forming the column 41 whereby

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steam condensing above the level of the ring is directed to the center of the demister packing and this condensate then passes down through the packing to wash it and improve its operation.

Means are provided for obtaining continuous blowdown of the feed water to thus maintain salts and solids within the evaporator shell below a predetermined level comprising the orifice 46 in the vent line from the deaerator for the feed water and an orifice 55. The orifice 55 is mounted in the blowdown line 56 connected to an outlet 57 from the evaporator shell and the line 56 passes through the blowdown cooler by being disposed within the feed water pipes 23 whereby the feed water leaving the evaporator shell functions to preheat the incoming feed water. The orifices 46 and 55 permit operation of the steam generator to produce steam at a predetermined pressure while obtaining the continuous blowdown.

I claim:

1. A sanitary steam generator having an evaporator shell, a unit mounted on said shell having a section for deaerating feed water and a section for demisting discharged steam, said deaerator section comprising a central column with a vent, a feed water spray outlet, and a packing in said deaerator section below said spray outlet, said demister section being separated from said column by a common wall whereby heat in the demister section is transferred to the deaerator section to aid in heating feed water, a packing in said demister section, and means disposed above the demister packing for causing condensation to spread over the latter packing to increase the efficiency thereof.

2. A sanitary steam generator as defined in claim 1 in which said condensation spreading means comprises an annular ring on said wall which directs condensate to the center of said demister packing for washing thereof.

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3. A sanitary steam generator having an evaporator shell, a unit mounted on said shell having a section for deaerating feed water and a section for demisting steam, said deaerator section comprising a central column with a vent therein, a feed water spray outlet, and a packing therein below said spray outlet, said demister section surrounding said column and having packing therein, and means disposed above the demister packing for causing condensation to fall onto the latter packing for washing thereof.

4. A sanitary steam generator comprising an evaporator shell, an opening in the wall of said shell in the upper portion thereof, a unit disposed in said opening having a deaerator section and a demister section located therein, a common partition wall separating said sections, means for spraying feed water into said deaerator section to remove air therefrom, said deaerator section being connected to said shell to permit said feed water to flow therein, means for directing steam formed in the shell through said demister section and to an outlet, a packing in said demister section, and a shelf within and extending from a wall of the demister section positioned to cause a portion of said steam to condense thereon and to direct the condensed steam into said packing to drip therethrough.

References Cited in the file of this patent

UNITED STATES PATENTS

440,410	Nelson	Nov. 11, 1890
988,661	Power	Apr. 4, 1911
2,294,501	Junkins	Sept. 1, 1942
2,428,768	Bertram	Oct. 14, 1947
2,663,286	Worn	Dec. 22, 1953
2,724,370	Kuhner	Nov. 22, 1955