Jan. 31, 1939. K. BEYRODT 2,145,287

ELECTRIC STEAM GENERATOR

Filed March 31, 1936

Fig. 1

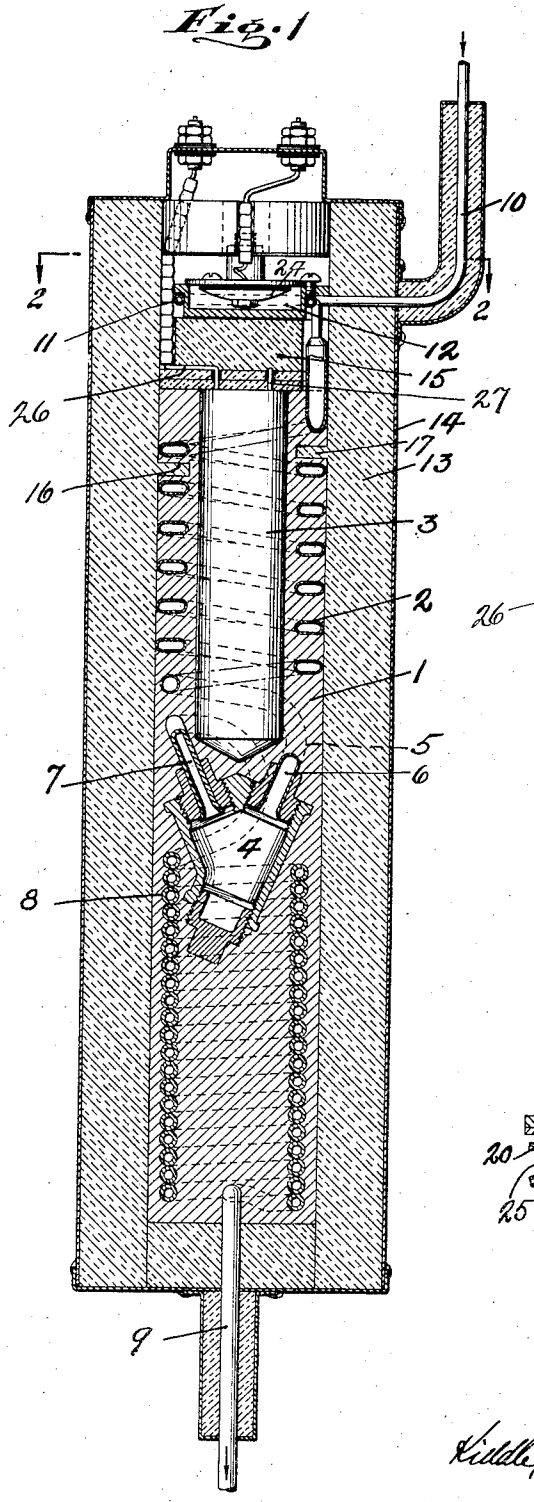


Fig. 2

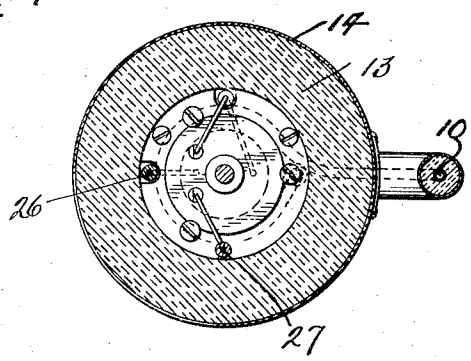
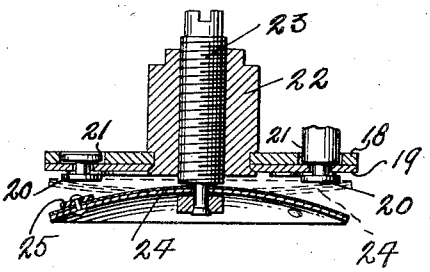


Fig. 3.



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ELECTRIC STEAM GENERATOR

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6 Claims. (Cl. 219—39)

My invention relates to an improvement in electric steam generators, and has for one of its objects the provision of a steam generator capable of generating superheated steam instantaneously within definite temperature limits, the electric input being temperature controlled and relatively small; the apparatus provides for relatively large intermittent superheated steam output.

My improved apparatus has a great variety of uses as, for example, in connection with sterilizing, cleaning, steaming of fabrics, spraying metals, etc.

Prior to my invention the universal practice in steam generator construction and operation has been to introduce the feed water into the lowest part of the heat accumulator. It will be evident that in such arrangements there will be sudden withdrawal of large amounts of heat from the lowest part of the apparatus, which causes quick cooling and eventually stops evaporation until the water level rises or until heat can be transferred to this point. This impairs continuous steam flow, causes surging and bumping, while at the same time a certain amount of water will be left in the accumulator at the end of the withdrawal of steam. This water will gradually evaporate and escape of steam at the open steam outlet of the device, or if this outlet be closed it may cause considerable pressure to be set up within the apparatus and associated pipe lines.

In my improved apparatus I propose to introduce the feed water at the top, the fluid passages being inclined toward the bottom of the apparatus, thereby first cooling down the top of the apparatus, the fluid flowing by gravity to a hotter part of the apparatus until evaporated. This is a very fast process, as will be appreciated, and it will be evident, furthermore, involves having the fluid seeking heat as distinguished from the heat seeking the fluid as in those devices above mentioned in which the feed water is introduced at the bottom.

A further improved feature in connection with my apparatus is the use of a temperature control device for the definite control of a metal mass entering into the construction of my apparatus. This temperature control is not only dependent upon the temperature of this metal mass but operates to close the heater circuit whenever feed water enters the steam generator.

In the accompanying drawing:

Fig. 1 is a sectional elevational view of an embodiment of my invention;

Fig. 2 is a section on the line 2—2 of Fig. 1; and

Fig. 3 is a detail in section of the temperature control device.

Referring to the drawing in detail, 1 designates a metal mass, a metal casting for example, which as illustrated takes the form of a cylindrical copper casting into which is cast a helical steel tubing 2 constituting the evaporating surface of my generator.

Extending downwardly into the metal mass 1 so as to be surrounded by the helix of the tubing 2 is a cartridge heating unit 3. This unit is of well known construction and is preferably cast in place.

Below the lower end of the cartridge heating unit is an equalizing chamber and water trap 4, the structure providing this chamber being cast into the metal mass 1. The lower end 5 of the tubing or evaporating surface 2 communicates with an inlet 6 of the equalizing chamber 4, while the outlet 7 of this chamber is in constant communication with superheater tubing 8 cast into the lower end of the metal mass 1, and disposed in a short lay helix, the lower end of this superheater tubing extending at 9 to the outside of the apparatus.

The upper end of the tubing 2 is coupled to feed-water pipe or tube 10 which enters the top of the apparatus and is coiled as shown at 11 about a temperature control chamber 12.

The apparatus thus far described is heat insulated with magnesia, asbestos or other suitable heat insulation 13 and enclosed in a tight fitting metal casing 14. It will be noted also that the feed water tubing 10 and outlet tubing 9 are heat insulated.

The temperature control chamber 12 is heat insulated from the metal mass 1 and from the cartridge heating unit by magnesia or other suitable heat insulation 15.

I also preferably provide a groove in the wall of the metal mass 1 as shown at 16 which I may fill with asbestos or other suitable heat insulator 17, this arrangement reducing the mass of metal adjacent the feedwater inlet and reducing surging and bumping when the apparatus is in use.

In the temperature control chamber 12 I mount suitable automatic electrical control apparatus, one form of which is shown in Fig. 3. This device consists of two round discs 18 and 19. Riveted to the disc 19 are four contacts 20 insulated from the disc 18 by mica or otherwise. The disc 18 is provided with four holes 21 in register with the contacts permitting the rivet heads to be located without touching the disc.

The plates or discs 18 and 19 are riveted to a

stud 22 which is internally threaded. Into this stud fits a threaded shaft 23 carrying a bimetal disc 24 on its lower end, provided on its upper surface with contacts 25 adapted to engage the contacts 20 when the bimetal disc takes the dotted line position shown in Fig. 3.

The leads for the heating unit 3 are designated 26 and 27 and after passing the temperature control switch are led to the outside of the casing 14.

When my improved apparatus is to be used and demand is made for steam, feed water is admitted through inlet 10. The temperature control device or thermostat of Fig. 3 and which, as will now be understood, controls the temperature of the metal mass 1 is actuated by the feed water, that is to say, as feedwater is admitted the thermostat will snap to the dotted line position of Fig. 3 to close a circuit to the heater, it being understood, however, that the thermostat is set always to maintain this metal mass at a certain predetermined minimum temperature. The feedwater entering the generator will absorb the heat of the metal mass 1 nearest the feedwater inlet, and flowing downwardly toward the equalizing chamber 5 will have its temperature raised gradually, the metal mass adjacent the feed water inlet cooling down rapidly on account of the restricted heat conductive area toward the feedwater inlet, obtained by casting in a piece of asbestos, the water temperature gradually increasing as it moves toward the lower end of the evaporating surface. By this arrangement heat is gradually imparted to the water thereby reducing surging and bumping to a minimum.

It will be appreciated of course that the steam entering the equalizing chamber 4 will pass immediately to the superheater tubes 8 there to be superheated and discharged through exit 9 as superheated steam.

It will be appreciated that my invention provides an electric steam generator wherein use is made of a metallic mass in conjunction with an automatic temperature control therefor, to the exclusion of fluid heat accumulators. It will be appreciated also that the metal mass will be maintained at a predetermined temperature at all times.

It will be appreciated also that my invention provides for the generation of superheated steam at definite temperature limits instantaneously, involves relatively small temperature controlled electric input and comparatively large intermittent superheated steam output.

It will be apparent also that my improved apparatus provides for introducing the feed fluid at the top, the tubing 2 being arranged so as to slope toward the bottom of the apparatus, insuring more efficient and noiseless operation.

It will be understood that changes may be made in the details of construction and arrangement of parts within the purview of my invention.

It is to be understood also that types of temperature control apparatus other than that shown and described may be employed without departing from the spirit and scope of my invention.

What I claim is:—

1. An electric steam generator comprising a metal mass, tubing constituting the evaporating surface of the generator cast into said metal mass, an electric heater for supplying heat to the generator, a thermostatic control device for said heater adapted to open and close the circuit of said heater at predetermined temperatures of said metal mass, an enclosure for said control device, and a fluid inlet for said tubing coiled about said enclosure so that said control device will close the circuit of said heater immediately upon the admission of fluid to said inlet.

2. An electric steam generator comprising a metal mass, tubing constituting the evaporating surface of the generator cast into said metal mass, said tubing having a fluid inlet at its upper end, an electric heater for supplying heat to the generator, an automatic control device for said heater adapted to open and close the circuit of said heater at predetermined temperatures of said mass, an enclosure for said automatic control device, heat insulation intermediate said metal mass and said control device, said fluid inlet surrounding said enclosure for the automatic control device so that said automatic control device will close the circuit of the heater as fluid passes through said inlet.

3. An electric steam generator comprising in combination an elongated metal mass and metal tubing cast integral with each other, the tubing extending helically of the metal mass and constituting the evaporating surface of the generator, a stationary electric resistance heater extending into said mass so as to be surrounded by said tubing, and an automatic control for the circuit of said heater located adjacent to but heat insulated from said metal mass and from said heater.

4. An electric steam generator comprising in combination a metal mass, tubing cast into said mass and extending helically thereof, said metal mass being provided with a longitudinally extending central space, an electric heating unit extending into said space, a chamber at the lower end of the heating unit with which the lower end of said tubing communicates, tubing below the first mentioned tubing cast into said metal mass and having its upper end in communication with the last mentioned chamber for the generation of superheated steam.

5. An electric steam generator comprising in combination a metal mass, metal tubing cast thereinto and extending helically thereof, an electric heater extending into said metal mass in position to be surrounded thereby and by said tubing, the inlet for said tubing being adjacent the upper end of said metal mass, the heat conducting area of the metal mass adjacent the fluid inlet being restricted, and means operating automatically to maintain the metal mass at a predetermined temperature, and adapted to close a circuit to the electric heater as feedwater is admitted to the apparatus.

6. An electric steam generator comprising in combination a metal mass, tubing constituting a fluid evaporating surface cast into said mass and extending helically thereof, said mass being provided with a central chamber, an electric heater extending into and fitting said chamber to be surrounded by said tubing, a thermostatic control device for said heater located adjacent the top of said metal mass and heat insulated therefrom for maintaining the mass at a predetermined temperature, an enclosure for said thermostatic control, and an inlet for said tubing coiling about said enclosure to effect operation of said thermostat whereby as feed-fluid is admitted to the apparatus said thermostat will close the circuit to the electric heater.

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