

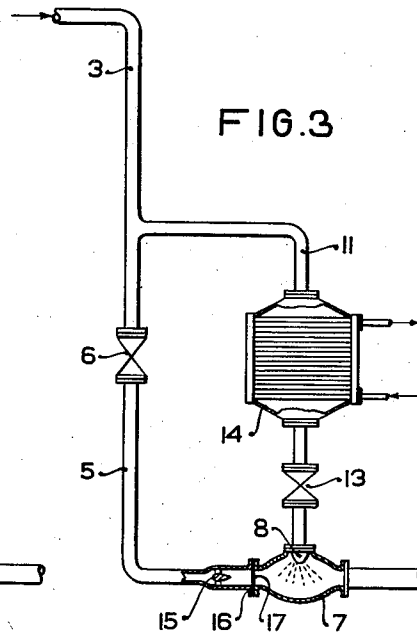
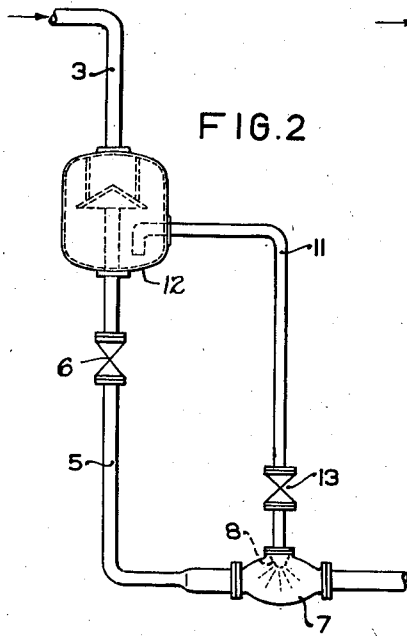
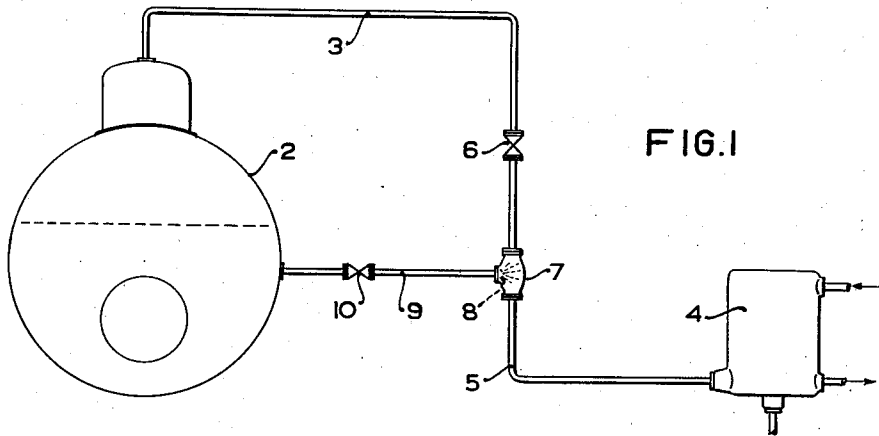
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MEANS FOR SUPPLYING REDUCED PRESSURE STEAM TO HEAT EXCHANGING APPARATUS

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MEANS FOR SUPPLYING REDUCED PRESSURE STEAM TO HEAT EXCHANGING APPARATUS

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5 Claims. (Cl. 122-459)

In the pasteurization of milk, the vaporization of liquids in vacuum pan operations and for other similar purposes the liquid to be treated is usually heated by reduced pressure steam. This steam is ordinarily saturated steam generated by a boiler and supplied to the heat exchanging apparatus through a reducing valve. Now, it is well known in the art that owing to this reduction of pressure the steam is, dependent upon the boiler pressure, more or less superheated and this superheat may have an injurious effect on milk and other heat-sensitive liquids.

This inconvenience can be met, in accordance with my present invention, by injecting into the reduced pressure steam a small quantity of boiler water substantially under boiler pressure, said water being thus evaporated by the superheat of the steam. If the amount of boiler water injected into the reduced pressure steam is suitably regulated, the result will be dry saturated steam. Said water need not necessarily be withdrawn directly from the boiler but may be condensate of the high pressure steam.

It will be understood that this result is attained by the use of a small portion of the water from which the heating steam is generated, so that in recycling the steam after condensation thereof no foreign water is introduced into the boiler. Moreover, said water is under sufficient pressure to be atomized.

The water used for saturating the heating steam need not necessarily be withdrawn from the same boiler by which said steam has been supplied, but may be derived from another boiler of the same boiler plant. In this respect two boilers of a boiler plant are to be regarded as equivalents the one of the other.

In order that the manner in which the invention may be carried into practice may be fully understood, several embodiments, selected as examples, will now be described with reference to the accompanying drawing. In the drawing:

Fig. 1 shows diagrammatically a steam boiler plant embodying the present invention, and

Figs. 2 and 3 are fragmentary views illustrating alternative embodiments of the invention.

Referring particularly to Fig. 1, 2 is a boiler in which saturated steam is generated which flows through conduits 3, 5 to a heat exchanging apparatus 4. The pressure of the steam supplied by the boiler is reduced to atmospheric value by a reducing valve 6. Thus, the steam in pipe 5 beyond valve 6 has a pressure of about one at-

mosphere, but may have a temperature, which considerably exceeds 100° C.

Pipe 5 comprises a chamber 7 into which opens a spraying nozzle 8 connected by conduit 9 to the water space of the boiler. By opening valve 10 boiler water is injected into chamber 7 under sufficiently high pressure to be atomized. In said chamber, it is evaporated, owing partly to the expansion, partly to the superheat of the steam supplied by pipe 5, so that dry saturated steam of atmospheric pressure flows to the pasteurizer or other heat exchanging apparatus 4.

The proper amount of water injected into the chamber 9 can be controlled by means of the valve 10, or in any other suitable manner.

In the modification shown in Fig. 2 the conduit 3 for supplying steam under boiler pressure is incompletely insulated so that a suitable portion of the steam flowing therethrough condenses therein. Conduit 3 includes a separating vessel 12 which is connected by conduit 11 to the spraying nozzle 8. The condensate accumulated in vessel 12 reaches the nozzle 8 through a control valve 13.

In the embodiment illustrated in Fig. 3, branch 11 comprises a small, water cooled condenser 14 in which steam condenses.

That part of pipe 5 which is adjacent to chamber 7 is enlarged and contains a central streamline body 15, whereas a plate 16 having a great number of evenly distributed perforations 17 is provided between said pipe and chamber 7. Thus the steam enters said chamber in a uniform flow, which furthers the mixing thereof with the water injected and atomized by the spraying nozzle 8.

What I claim is:

1. In combination, a steam boiler, a heat exchanging apparatus, a conduit connecting said boiler with said heat exchanging apparatus, pressure reducing means in said conduit, a spraying nozzle opening in said conduit between said pressure reducing means and said heat exchanging apparatus, and means for supplying water to said nozzle at substantially the same pressure and temperature as the water in said boiler.

2. In combination, a steam boiler, a heat exchanging apparatus, a conduit connecting said boiler with said heat exchanging apparatus, pressure reducing means in said conduit, a spraying nozzle opening in said conduit intermediate said pressure reducing means and said heat exchanging apparatus, a second conduit connecting a point of said first conduit before said pressure reducing means with the said spraying nozzle, and condensing means in said second conduit.

3. In combination, a steam boiler, a heat ex-
changing apparatus, steam pressure reducing
means, an incompletely insulated conduit for
supplying steam from said boiler to said pressure
reducing means, a second conduit leading from
said pressure reducing means to said heat ex-
changing apparatus, a spraying nozzle opening
in said second conduit, and a third conduit for
supplying condensate from the said first conduit
to said spraying nozzle.

4. In combination, a steam boiler, a heat ex-
changing apparatus, a conduit for supplying
steam from said boiler to said heat exchanging
apparatus, pressure reducing means in said con-
duit, a spraying nozzle opening in said conduit
intermediate said pressure reducing means and

said heat exchanging apparatus, a second con-
duit connecting said boiler to said nozzle for
supplying boiler water thereto.

5. In combination, a steam boiler, a heat ex-
changing apparatus, a conduit connecting said
boiler with said heat exchanging apparatus, pres-
sure reducing means in said conduit, a spraying
nozzle opening in said conduit between said pres-
sure reducing means and said heat exchanging
apparatus, and means for supplying water to said
nozzle at substantially the same pressure and
temperature as the water in said boiler, and
means provided in said conduit intermediate the
pressure reducing means and the nozzle for equal-
izing the flow of steam in said conduit.

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