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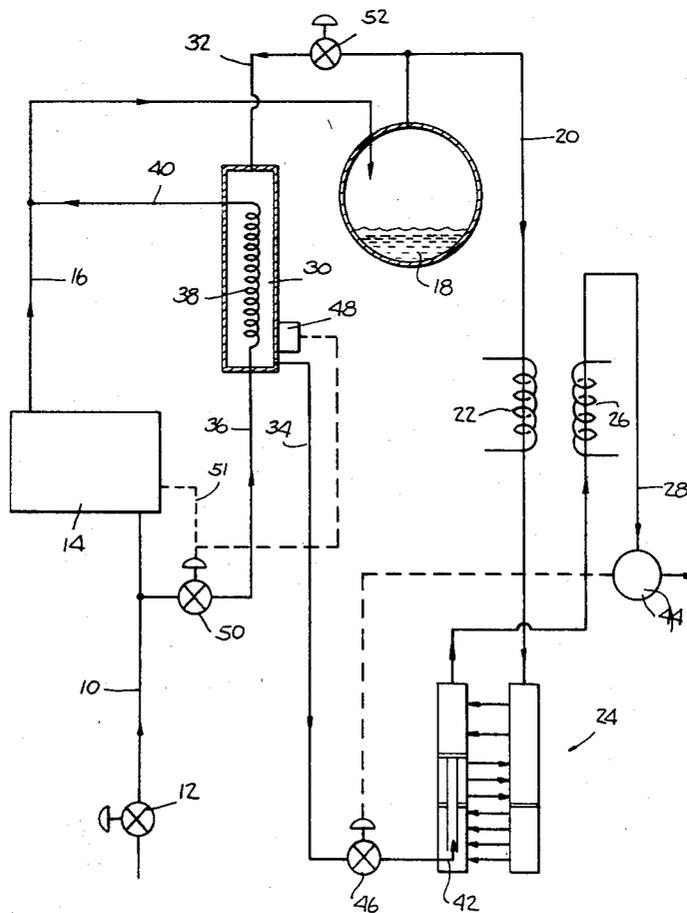
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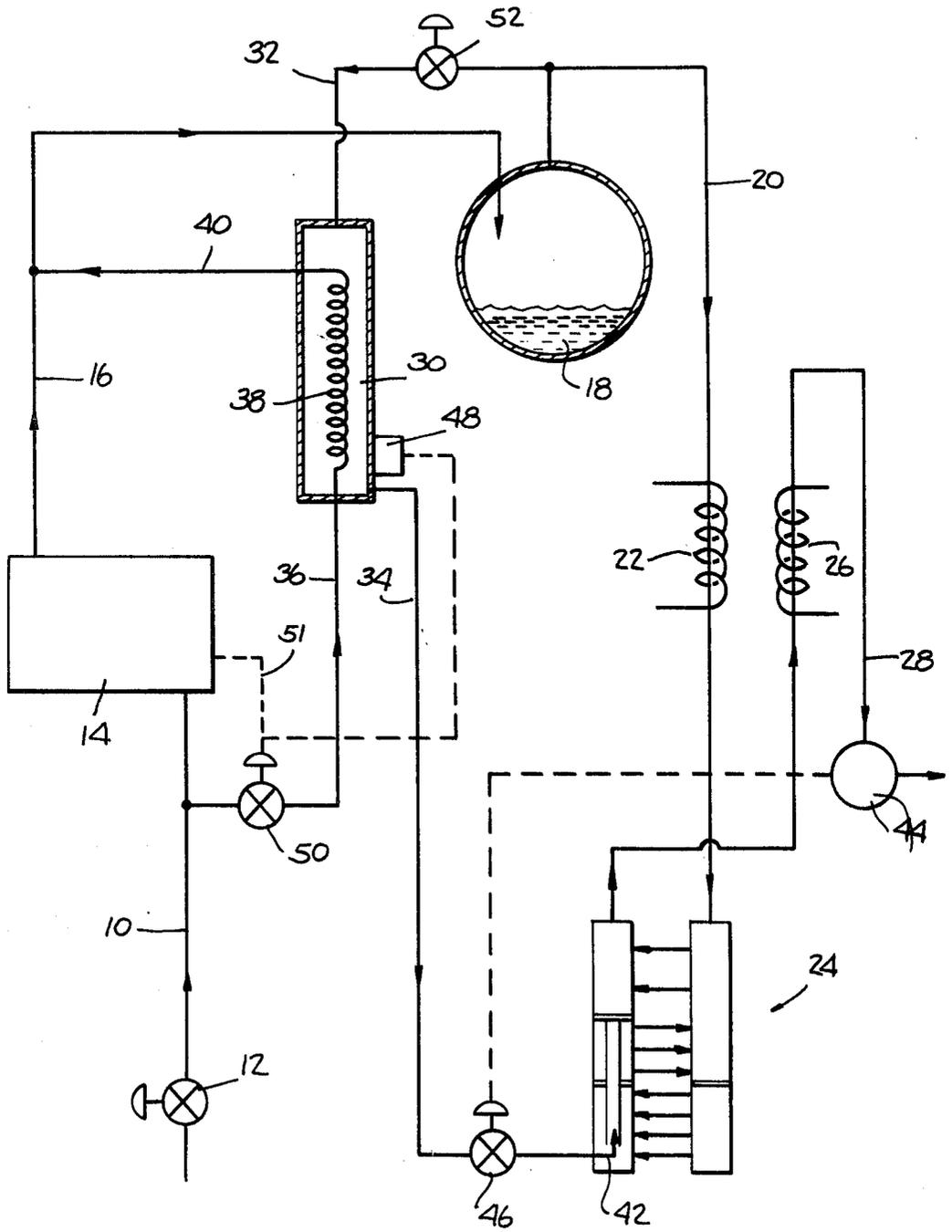
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[54] **METHOD AND APPARATUS FOR OBTAINING PURE SPRAY WATER FOR STEAM DESUPERHEATING PURPOSES**
10 Claims, 1 Drawing Fig.

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 165/40, 165/66, 122/487, 261/160
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ABSTRACT: This invention relates to a method and apparatus for obtaining pure spray water for steam desuperheating purposes wherein a portion of the steam produced in the boiler is passed through a condensing chamber, and the liquid condensate is then used as the spray water.





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**METHOD AND APPARATUS FOR OBTAINING PURE
SPRAY WATER FOR STEAM DESUPERHEATING
PURPOSES**

This invention relates to a method and apparatus for obtaining pure spray water for desuperheating purposes when the boiler feed water is contaminated. It will be appreciated that in both utility and shipboard installations the boilers operate with a condenser, and hence recirculate substantially all of the feed water. On the other hand, in many industrial applications there is substantially 100 percent makeup feed water. This disclosure relates to the latter application and, accordingly, the feed water is of a relatively low purity and cannot satisfactorily be used in a spray-type desuperheater. Applicant has discovered a novel combination of elements combined in such a way as to afford a very economical, efficient and practical solution of the difficulties in the problem above discussed, as will become apparent as the description proceeds.

Briefly, in a power generating system wherein steam from a boiler is passed through a superheater and a spray-type desuperheater, my invention contemplates the provision of a new and improved method of processing spray water for said desuperheater characterized by the steps of withdrawing steam from the boiler and passing it to a heat exchange chamber, condensing the steam in this heat exchange chamber by passing cool boiler feed water through a coil mounted therein. The next step is to withdraw the condensed steam and pass it to the desuperheater, as spray water.

In a power-generating system having a boiler, a superheater and a spray type desuperheater, my invention, in another form thereof, contemplates the provision of a combination of elements including a heat exchange chamber, means for withdrawing steam from the boiler and passing it to the heat exchange chamber, means for passing boiler feed water through the chamber to condense the steam, and means for withdrawing the so condensed steam from the chamber and passing it to the desuperheater.

There has thus been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which this disclosure is based may readily be utilized as the basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that this disclosure be regarded as including such equivalent constructions as do not depart from the spirit and scope of the invention.

One embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing forming a part of the specification, wherein:

The FIGURE is a schematic diagram of a power-generating system embodying the concept of my invention for obtaining pure spray water for steam desuperheating purposes.

In the embodiment of the invention illustrated, the apparatus for obtaining pure spray water for desuperheating purposes comprises an inlet pipe 10 with a throttle valve 12 through which approximately 300,000 lbs. per hour of feed water enters the system at a temperature of about 220° F. for example. The boiler feed water passes to a member 14 which may be an economizer, a fixed orifice plate or a throttle valve with a pressure drop of the order of about 15 p.s.i., and from there along line 16 to a boiler 18. When the member 14 is an economizer it raises the boiler feed water to a temperature of about 402° F. The steam leaves the boiler at a temperature of about 540° F. and a pressure of about 1,000 p.s.i.g. passes along line 20 to the first stage 22 of a superheater, and then to a desuperheater indicated generally at 24. It will be appreciated that any suitable type of spray desuperheater may be

employed as will be discussed more fully hereinafter. From the desuperheater, the steam passes to the second stage superheater, the steam passes to the second stage superheater 26 and then to the turbine through a main steam line 28 at a temperature of about 850° F. and a pressure of about 900 p.s.i.g.

In order to provide pure spray water for the desuperheater 24, a heat exchange or condensing chamber 30 is provided which receives steam from the boiler 18 through line 32. The steam is condensed in chamber 30 and the condensate so formed passes along line 34 to the desuperheater 24. In order to condense the steam in the chamber 30, cold boiler feed water is taken from line 10, passed along line 36 and through a coil 38 in the chamber 30. The so heated feed water is then led back into the feed line 16 as by means of line 40, provided for the purpose.

It will be appreciated that temperature control of the steam leaving the superheater for the turbine is effected by the introduction of spray water through a spray nozzle 42 in the desuperheater 24. The steam temperature is sensed in the main steam line 28 by a thermocouple 44, or other such device, in response to which temperature spray throttle valve 46 is actuated to control the flow through the spray nozzle 42 and thereby control the amount of desuperheating desired. A level control, indicated at 48, used in combination with a throttle valve 50 serves to control the volume of cooling water entering the coil 38 in chamber 30, thereby controlling the volume of steam condensed in the chamber. When the member 14 is a throttle valve, it may be linked, as by means of linkage 51, to the throttle valve 50 so that as valve 51 opens, valve 50 closes and when valve 50 opens, valve 51 closes. A hand-operated isolation valve 52 is provided.

It will thus be seen that the present invention does indeed provide an improved method and apparatus for obtaining pure spray water for steam desuperheating purposes which is superior in simplicity, economy and efficiency as compared to prior-art such devices.

Although a particular embodiment of the invention is herein disclosed for purposes of explanation, various modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains.

What I claim and desire to be secured by letters patent is:

1. In a power-generating system having a boiler, a superheater, piping means for carrying steam from the boiler to the superheater, and a spray-type desuperheater piping means for carrying superheated steam from said superheater to said desuperheater, the combination comprising a heat exchange chamber, means for withdrawing steam from said boiler and passing it to said heat exchange chamber, means for passing boiler feed water through said chamber to condense said steam, and means for withdrawing the condensate from said chamber and passing it to said desuperheater as spray water.

2. Apparatus according to claim 1 wherein said means for passing boiler feed water through said chamber to condense said steam comprises a first pipeline leading from the boiler feed line to said chamber, a second pipeline leading from said chamber to said boiler feed line, a fixed diameter orifice mounted in said boiler feed line between said first and second pipelines to cause a pressure drop.

3. Apparatus according to claim 1 wherein said means for passing boiler feed water through said chamber to condense said steam comprises a first pipeline leading from the boiler feed line to said chamber, a throttle valve mounted in said first pipeline, a condensate level control indicator mounted on said chamber for controlling said throttle valve, a second pipeline leading from said chamber to said boiler feed line, a second throttle valve mounted in said boiler feed line between said first and second pipeline, means for operating said second throttle valve responsive to operation of said first throttle valve.

4. Apparatus according to claim 1 wherein means for passing boiler feed water through said chamber to condense said steam comprises a coil mounted within said chamber which receives boiler feed water from the boiler feed water

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inlet pipe before the economizer and discharges boiler feed water to the boiler feed water line after the economizer.

5. Apparatus according to claim 1 wherein said means for passing boiler feed water through said chamber to condense said steam comprises a pipeline leading from the boiler feed line to said chamber and containing a throttle valve, and a condensate level control indicator mounted on said chamber for controlling said throttle valve.

6. Apparatus according to claim 1 wherein said means for withdrawing the condensed steam from said chamber and passing it to said desuperheater as spray water comprises a pipeline containing a spray throttle valve, and a thermocouple mounted in the main steam line for controlling said throttle valve.

7. In a power-generating system having an economizer, a boiler, a boiler feed water inlet line having a first portion for feeding boiler feed water into said economizer and a second portion for receiving feed water from said economizer and carrying it to said boiler, a superheater, piping means for carrying steam from the boiler to the superheater, and a spray-type desuperheater, piping means for carrying superheated steam from said superheater to said desuperheater, the combination comprising a heat exchange chamber, a pipeline containing a manually operated throttle valve for withdrawing steam from said boiler and passing it to said heat exchange chamber, a coil mounted within said chamber, a pipeline leading from said first portion of the boiler feed water inlet line to one end of said coil, a pipeline leading from the other end of said coil to the second portion of the boiler feed water inlet line, a throttle valve mounted in said line leading from said first portion of the boiler feed water inlet line to said coil, a condensate level control indicator mounted on said chamber for controlling said throttle valve, a pipeline extending from said chamber to said desuperheater for withdrawing con-

densed steam from said chamber and passing it to said desuperheater, a spray throttle valve mounted in said last named pipeline, a thermocouple mounted in the main steam line for controlling said spray throttle valve.

8. In a power-generating system wherein steam from a boiler is passed through a superheater and a spray-type desuperheater, the method of processing spray water for said desuperheater comprising the steps of withdrawing steam from said boiler and passing it through a heat exchange chamber, condensing said steam in said heat exchange chamber by passing cool boiler feed water through a coil in said heat exchange chamber, withdrawing the condensate from said chamber and passing it through said desuperheater as spray water.

9. In a power-generating system wherein steam from a boiler is passed through a superheater and a spray-type desuperheater, the method of processing spray water for said desuperheater comprising the steps of withdrawing steam from said boiler and passing it through a heat exchange chamber, condensing said steam in said heat exchanger chamber by passing cool boiler feed water through a coil in said heat exchange chamber, controlling the flow of boiler feed water into said chamber to control the volume of steam condensed in said chamber, withdrawing the condensate from said chamber and passing it through a spray nozzle in said desuperheater, and controlling the flow of condensate to said desuperheater to obtain the desired desuperheating.

10. A power-generating system according to claim 7 further comprising a second stage superheater and piping means for receiving the steam from said desuperheater and carrying it to said second stage superheater, and said thermocouple being mounted in the main steam line at a location after said second stage superheater.

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