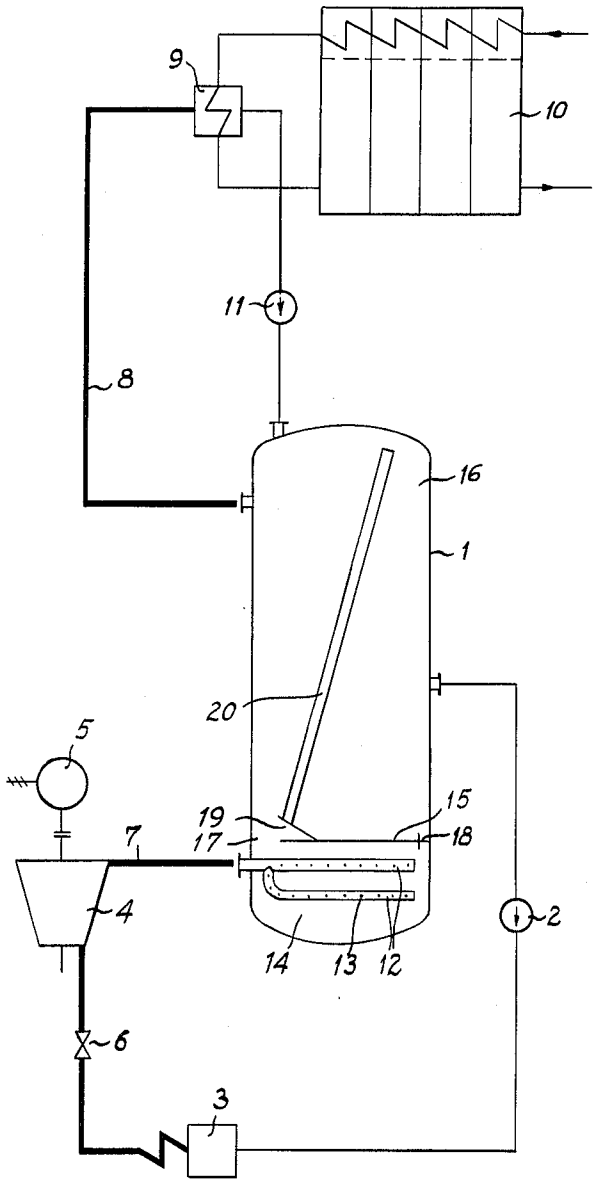
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STEAM POWER PLANTS

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STEAM POWER PLANTS

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The invention relates to steam power plants, and more specifically to such plants having heat exchangers arranged for utilising heat contained in steam discharged or removed from a turbine.

In such plants it is often desired to avoid rapid fluctuations of steam pressure and steam quantity at the input to the heat exchanger. It is known to use regulating arrangements for this purpose, by means of which rapid fluctuations of the steam pressure and steam quantity are compensated at the turbine. These arrangements involve an undesirable loss of pressure and energy and are very expensive.

The present invention consists in a steam power plant comprising a heat exchanger arranged for utilising heat contained in steam discharge or removed from a turbine, storage means being provided for receiving the said steam and supplying it to the heat exchanger, the storage means being adapted for containing water and having inlet means for the steam so disposed and arranged that depending on the load, a variable proportion of the steam is fed to the storage means to below the water level therein. In this way, the superfluous steam quantity is taken up by the water space in the storage means, and the pressure in the storage means only slowly increases.

Advantageously, all of the steam is fed to the storage means, partly below the water level therein and partly above the water level therein. Preferably, the inlet means comprise an inlet pipe extending over a substantial part of the height of the storage means, the inlet pipe having openings distributed over its height.

The inlet pipe may be disposed in an auxiliary chamber forming part of the storage means, the auxiliary chamber being in communication with a main chamber of the storage means by a passage for water and a passage for steam.

Advantageously, the auxiliary chamber and the water-communication passage are of such small dimensions that for heavy load conditions their water content is substantially blown out therefrom by incoming steam. Thus, for rapid increases in load, most of the additional steam is condensed in the auxiliary chamber, so that the heat exchanger can only slowly increase in pressure until an equivalent condition exists in the storage means. At high load, most of the water in the auxiliary chamber is blown out, so that there is only a slight loss of pressure. When the turbine load falls and the steam quantity thus also drops, the pressure at the heat exchanger does not rapidly fall since part of the energy requirement of the heat exchanger is covered by evaporation of the water contained in the storage means.

Advantageously, the auxiliary chamber is associated with a receiving chamber for the blown out water, the receiving chamber having a duct arranged for conducting water therefrom to a region of the main chamber remote from the water-communication passage. The heat exchanger may be a final pre-heater of a multi-stage vaporizer.

In order to make the invention clearly understood, reference will now be made to the accompanying drawing which is given by way of example and which diagrammatically illustrates a steam power plant of the invention, applied to a multi-stage vaporizer arrangement.

The steam power plant comprises a boiler **3** which

provides steam for a turbine **4**, the boiler being fed by a feed pump **2** from a horizontal storage tank **1**. The turbine power is controlled in dependence on the energy requirements of a load **5** driven by the turbine, by a control valve **6**. Exhaust steam from the turbine **4** passes through a duct **7** to the storage tank **1** and from the tank **1** through a duct **8** to a pre-heater **9** which is associated with a multi-stage vaporizer **10** which is in the form of a surface-type heat-exchanger. The steam is condensed in the pre-heater **9** and is fed by a pump **11** to the storage tank **1**.

Introduction of the turbine exhaust steam into the tank **1** through the duct **7** is effected by one or more vertical pipes **12** which are provided with outlet openings **13** distributed over their height. These pipes extend into an auxiliary chamber **14** which is separated from the main chamber **16** of the tank **1** by a partition **15** but which is in steam-communication with the main chamber **16** of the tank **1** by an opening **17** at the top of the partition **15** and is in water-communication with the main chamber **16** of the tank **1** by an opening **18** at the bottom of the partition. The auxiliary chamber **14** and its water-communication opening **18** are so small that due to the steam quantity resulting when the turbine is heavily loaded, a large part of the water content of the auxiliary chamber **14** is blown out of the auxilary chamber **14** and is caught in a receiving space **19** from which it is conducted by a pipe **20** to a region of the main chamber **16** remote from the opening **18**.

The water content of the auxiliary chamber **14**, as mentioned above, is low, and increases with decreasing load. It is thus achieved that with high load the pressure loss in the steam introduction system is not increased by an unnecessarily high water column. On the other hand, it is achieved that independent of the water level in the main chamber **16** of the tank **1**, some of the steam entry openings **13** always lie below water. With sudden increase in load, steam is always blown in below water and is condensed, so that rapid alterations of steam quantity can not occur at the pre-heater **9**. Conversely, for sudden decreases in load, a sudden drop in pressure at the pre-heater **9** is prevented by evaporation of the water contained in the tank **1**.

Various modifications are possible. For example, the controlled distribution of the steam by supplying a partial amount to a region above the water space of a storage tank can be effected in other ways. Moreover, a direct connection can be established between the turbine and the pre-heater, for a partial steam amount. Also, the supply of a partial amount of the steam to a region below water can be effected by a horizontally disposed pipe, although the use of a pipe vertically disposed within an auxiliary chamber is preferred. The auxiliary chamber may be an entirely separate container, connected to the main container.

I claim:

1. A steam power plant comprising a turbine, a heat exchanger and a storage means,

said heat exchanger being interconnected with said turbine through said storage means to utilize heat contained in steam removed from said turbine,

said storage means functioning to receive said steam and supply said steam to said heat exchanger,

said storage means defining a water carrying portion and having a steam inlet means so disposed and arranged that depending on the load, a variable proportion of the steam is fed to the storage means to below the water level therein.

2. A steam plant as claimed in claim **1**, wherein the heat exchanger is a final pre-heater of a multi-stage vaporizer.

3. A steam power plant as claimed in claim 1 wherein said inlet extends partly below and partly above water carried in said water carrying portion.

4. A steam plant as claimed in claim 3, wherein the inlet means comprise an inlet pipe extending over a substantial part of the height of the storage means, the inlet pipe defining openings distributed over its height.

5. A steam plant as claimed in claim 4, wherein the inlet pipe is disposed in an auxiliary chamber defined by part of the storage means, the auxiliary chamber being in communication with a main chamber defined by said storage means by a passage for water and a passage for steam.

6. A steam plant as claimed in claim 5, wherein the auxiliary chamber and the water-communication passage are of such small dimensions that for heavy load conditions their water content is substantially blown out therefrom by incoming steam.

7. A steam plant as claimed in claim 6, wherein the auxiliary chamber is associated with a receiving chamber for the blown out water, the receiving chamber having a duct arranged for conducting water therefrom to a region of the main chamber remote from the water-communication passage.

8. A steam power plant comprising a turbine, a heat exchanger and a storage means,

said heat exchanger being interconnected with said turbine through said storage means to utilize heat contained in steam removed from said turbine,

said storage means defining an auxiliary water carrying chamber and a main water carrying chamber with a common steam passageway extending between said chambers and a water passageway below said steam passageway extending between said chambers,

an inlet pipe from said turbine extending into said auxiliary chamber having a first portion exposed to said steam passageway and a second portion extending under the water level normally present in said auxiliary chamber so that a variable proportion of steam from said turbine can be fed to the storage means below the water level in said auxiliary chamber.

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