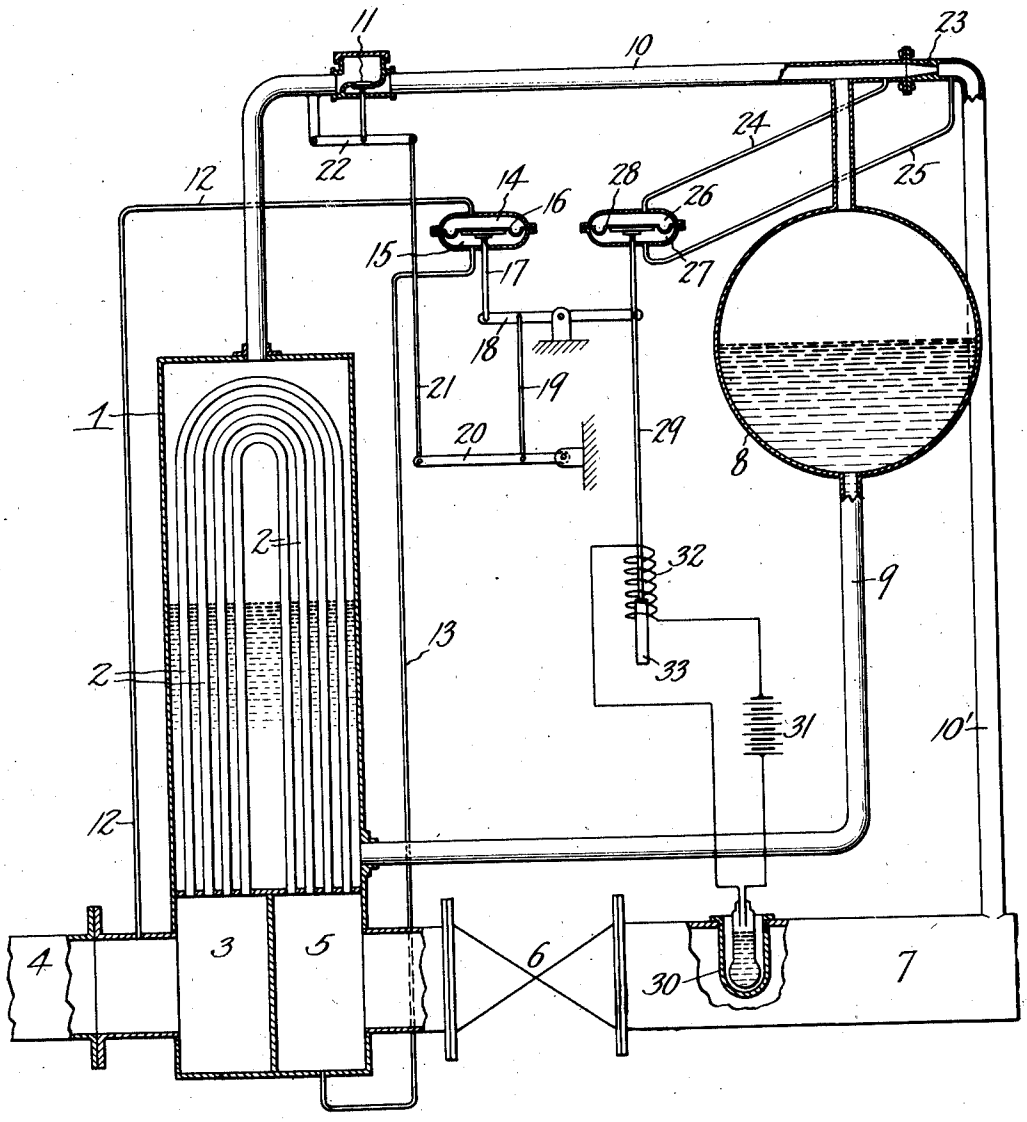
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DESUPERHEATER CONTROL

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WITNESS

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DESUPERHEATER CONTROL.

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This invention relates to steam desuperheaters used for transferring to a body of water any excess heat that the steam may have over that desired for an engine or other receptive device and it relates more particularly to desuperheaters of the non-contact type in which, like surface condensers, the steam transfers its heat to the water through a conducting partition.

The amount of superheat is generally subject to fluctuations and in the absence of proper control may pass steam to the receptive device, having an excess temperature, whereas it may be desired that the temperature of the steam supplied to the device remain at constant temperature. The body of water designed to absorb the surplus heat, may be made to act as a compensator, acting to absorb the surplus heat at a greater rate when such surplus is excessive, so that the desuperheated steam may flow from the desuperheater at a fixed temperature.

The object of the present invention is to supply control means for insuring such constant temperature without manual aid.

The invention comprises regulating means for varying the area of water exposed to the superheated steam according to the variation in the volume of superheated steam flow, the resulting variation in the flow of steam generated in the desuperheater being made to check the change in heat transferring area when said change has reduced the superheat to the required amount. Such flow control regulation may be sufficient when the temperature of the superheated steam is held within certain limits.

The invention further comprises a thermostat or equivalent device in the low pressure side which may be used with the aforementioned flow controlled checking means, to balance the means causing the change in area of heat transfer and hold it at such a point as will give a constant temperature for the low pressure system, and this irrespective of variations in the degree of superheat of the high pressure system.

The accompanying drawing represents in section a schematic view of an embodiment of my invention.

In the drawing is shown a desuperheater of the non-contact type, having an outside water drum 1, inside of which are placed U-tubes 2 which communicate at one end with a steam chest 3 supplied with superheated steam from pipe 4 and at the other end with a steam chest 5 which may deliver steam through a reducing valve 6 to a low pressure pipe 7. At 8 is shown a container partially filled with water, which container may be the ordinary low pressure boiler or an auxiliary drum. From the lower part of the container 8 a pipe 9 supplies water from the container to the desuperheater 1. The upper part of the container 8 and the desuperheater are connected by steam pipe 10 having a throttle valve 11. The throttling of this valve 11 provides a means whereby the pressure in the steam space of the desuperheater may be kept above that of the steam space in the container 8, the result of which is to hold the water level in the desuperheater below that of the water level in the container 8. The amount of heat transferred from the superheated steam to the water in the desuperheater is approximately proportional to the area of the pipes 2 that are exposed to the direct contact of the water. When a greater amount of superheated steam is flowing, it becomes desirable to have a greater amount of water in contact with the tubes. By means of pipes 12 and 13 connected respectively to the steam chests 3 and 5 and to chambers 14 and 15 on opposite sides of a diaphragm 16, the variation in the differential pressure between the steam in steam chests 3 and 5 is made to communicate motion to diaphragm 16 and from it through rod 17, lever 18, rod 19, lever 20, rod 21 and lever 22 to throttle valve 11. An increase in flow of steam through tubes 2 will increase the differential pressure between chests 3 and 5 and result in a downward motion of the diaphragm 16 which will cause the throttle valve 11 to open further. When the throttle opens the pressure over the water in 1 will diminish and allow the water therein to rise to a higher level and thus expose more area for the transmission of heat from the superheated steam to the water. As a check to this regulating feature, I place a restriction 23 in the discharge line from the throttle valve and on each side of this restriction I lead pipes 24 and 25 to chambers 26 and 27 having between them a diaphragm 28 which is connected by rod 29 to the lever 18, the same being substantially the elements of a flow meter. The proportions of these parts will be made such that the throttle 11 will be prevented from overtravel and will be checked when the desuperheating operation arrives at the desired point. The discharge

line 10 from the desuperheater may be connected through pipe 10' to the delivery pipe 7 that is receiving the desuperheated steam.

The water level in the desuperheater may also be controlled by a thermostat or other thermal device responsive to the temperature in the low pressure pipe. At 30 is shown a thermostat in the low pressure pipe operating through a source of electrical energy 31, a solenoid 32, the core 33 of which is connected with the lever 18 as shown. If the temperature of the steam coming from the desuperheater is excessive, the thermostat 30 will close the circuit whereupon the solenoid 32 will lift the core 33 and cause the further opening of the throttle valve 11. The water will then rise in the desuperheater, taking away more heat from the superheated steam until the temperature of the low pressure steam in pipe 7 has been reduced sufficiently to cause the thermostat 30 to again open the circuit and stop the further opening of the throttle 11. It is to be observed that the operation of the thermostatic control is, to a certain extent, similar to a micrometer adjustment to the flow control devices, but it can also be used beneficially in connection therewith.

I have shown the throttle 11 as located in the steam line 10 connecting the desuperheater steam space with the space above the water of the reservoir but it may evidently be placed in the water line 9, its sole function being to control the difference in level of the water in the two containers 1 and 8 and through this control of level to regulate the area of water exposed in the desuperheater.

I claim:—

1. In a regulator for controlling the output of a desuperheater, the combination comprising a desuperheater having means for varying the area of heat transference from steam to water, means responsive to a function of the quantity of heat transferred to vary said area, and means responsive to the volume of steam generated in the desuperheater to check the said first-mentioned responsive means.

2. In a regulator for controlling the output of a desuperheater, the combination comprising a desuperheater having means for varying the area of heat transference from steam to water, means responsive to the flow of superheated steam through the desuperheater to vary the said area, and means responsive to the volume of steam generated in the desuperheater to check the first mentioned flow responsive means.

3. In a regulator for controlling the output of a desuperheater, the combination comprising a desuperheater having means for varying the area of heat transference from steam to water, means responsive to the flow of superheated steam through the desuperheater to vary the said area, means responsive to the volume of steam generated in the desuperheater to check the first mentioned flow responsive means, and means subject to change of temperature of the desuperheated steam to also check the means for varying the area of heat transmission.

4. In a regulator for controlling the output of a desuperheater of the non-contact type in which the water level is regulatable, a reservoir of water adapted to have its water level above the water level of the desuperheater, a pipe connecting the reservoir and the desuperheater below their water levels, a pipe connecting the reservoir and desuperheater above their water levels, means for restraining the flow of water from the reservoir to the desuperheater, means responsive to a function of the quantity of heat transferred to vary said restraining means, to allow the water to assume a higher level when more heat is to be transferred, and means responsive to the volume of steam generated in the desuperheater to check said change in the restraining means.

5. In a regulator for controlling the output of a desuperheater of the non-contact type in which the water level is regulatable, a reservoir of water adapted to have its water level above the water level of the desuperheater, a pipe connecting the reservoir and the desuperheater below their water levels, a pipe connecting the reservoir and desuperheater above their water levels, means for restraining the flow of water from the reservoir to the desuperheater, means responsive to a function of the quantity of heat transferred to vary said restraining means, to allow the water to assume a higher level when more heat is to be transferred, and thermostatic means responsive to the temperature of the desuperheated steam to check the effort of the said function responsive means.

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