United States Patent

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[54] **STEAM PRESSURE AND TEMPERATURE REDUCING INSTALLATION**

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[52] **U.S. Cl.** **236/12**

[51] **Int. Cl.** **G05d 23/13**

[58] **Field of Search** 236/1-14, 20

[56] **References Cited**

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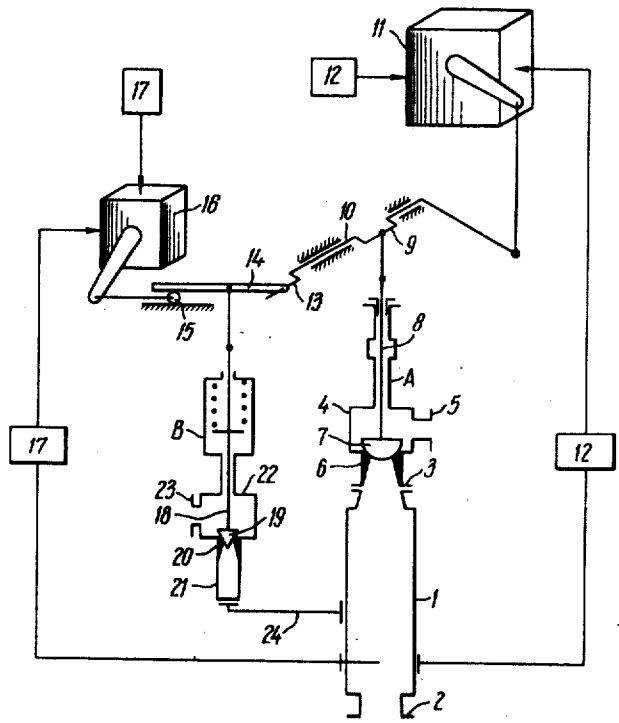
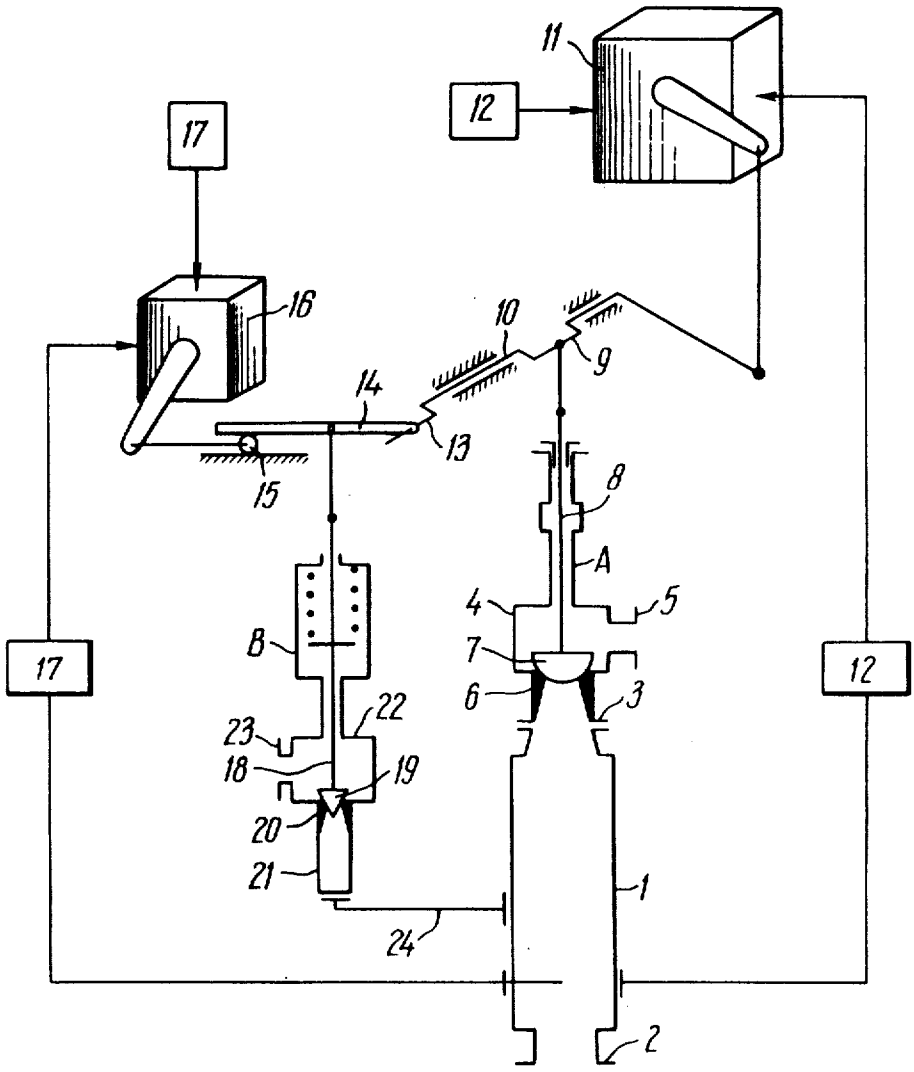
[57] **ABSTRACT**

An apparatus for delivering pressure-reduced and temperature-reduced steam has a container with steam and water inlets and an outlet. A steam valve and a water valve, each having an operating rod are provided at the steam and water inlets respectively. An elongated lever supported on a movable fulcrum at one end and articulatedly coupled to a driving means at the other end is provided to actuate the operating rods of the steam valve and the water valve so as to control their openings. The apparatus has a pressure regulator to which the driving means is sensitive. A second driving means which is sensitive to a temperature regulator which regulates the temperature in the container is provided to move the fulcrum point along the length of the rod. The rods of the steam valve and water valve are coupled respectively in a middle region and at an end remote from the movable fulcrum of the lever so that a ratio of the water-valve-rod distance from the fulcrum to the steam-valve-rod distance from the fulcrum may be varied as desired, to have an improved control of the valve openings.

1 Claim, 1 Drawing Figure

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STEAM PRESSURE AND TEMPERATURE REDUCING INSTALLATION

BACKGROUND OF THE INVENTION

The present invention relates to installations for simultaneous reduction of steam pressure and temperature, for example, at heating plants and power plants.

DESCRIPTION OF PRIOR ART

Known in the art is a steam pressure and temperature reducing installation comprising a container for steam and water, steam-feed adjusting valve and a water-feed adjusting valve each valve having a control rod. The container has a pipe for discharging the cooled steam. The rod of the steam-feed adjusting valve is linked mechanically with a drive controlled by a pressure regulator. The rod of the water-feed adjusting valve is articulated to a two-arm lever one arm of which is articulated to the rod of the steam valve.

The other arm of the lever is located on a vertically movable support which is linked mechanically with the drive controlled by a temperature regulator.

The rate of steam flow through the pressure and temperature reducing installation is regulated by the opening of the steam valve. The area through this opening is changed by the pressure regulator. The steam pressure is reduced to the required value in the steam valve.

The pressure reduced steam is fed into a reservoir. The water delivered into the reservoir through the water valve reduces the steam temperature to the required value.

Inasmuch as the temperature of the steam discharged from the reservoir must be constant at a constant amount of the reduced steam discharged from the steam valve, i.e., at a constant opening of the steam valve, the reservoir must be fed with a constant amount of water, i.e., the opening of the water valve must have a correspondingly constant area.

If the rate of steam flow through the steam valve increases or decreases, the rate of water flow through the water valve is also increased or decreased correspondingly, which means that the areas through the steam and water valves must also be correspondingly increased or decreased. The synthronous opening of the steam and water valves to the required degree is ensured by linking the rods of both valves mechanically with one and the same drive controlled by the pressure regulator.

Thus, with a prior art arrangement wherein the extents of operation of the water valve and the steam valve have a constant proportion owing to the support of fulcrum point not capable of being moved along the length of the lever,

$$H_{w.v.} = H_{s.v.} \cdot K,$$

where: $H_{w.v.}$ = the opening of the water valve

$H_{s.v.}$ = the opening of the steam valve

$$K = l_1/l$$

where: l = length of the lever from the support to the steam valve rod

l_1 = length of the rod from its to support to the water valve rod.

Since the lever support is movable only in the vertical direction, coefficient K is always constant.

If it becomes necessary to correct the temperature of the outlet steam, the rod of the water valve must be additionally shifted by the temperature regulator which will increase additionally the valve opening. In this case:

$$H_{w.v.} = H_{s.v.} \cdot K \pm \Delta h_{w.v.}$$

where: $\Delta h_{w.v.}$ = additional opening of the water valve.

If the opening of the steam valve must be fully closed, the area of opening through the water valve remains additionally increased by $\Delta h_{w.v.}$ so that water is admitted into the outlet pipe of the reservoir. This is a considerable disadvantage of the known steam pressure and temperature reducing installation.

FIELD OF THE INVENTION

It is, therefore, the main object of the present invention is to provide a steam pressure and temperature installation wherein the temperature regulator would change the ratio between the openings of the water and steam valves.

According to the invention, this object is accomplished by installing the fulcrum of the lever arm (connected to the drive which is controlled by the temperature regulator) with a provision for moving longitudinally along said lever arm.

As a result, when the movable fulcrum is shifted by the temperature regulator along the lever axis, the lengths of the lever arms l and l_1 are correspondingly changed, thus making coefficient K a variable quantity.

BRIEF DESCRIPTION OF DRAWING

The invention will be better understood from the description of a steam pressure and temperature reducing installation with reference to the accompanying drawing which illustrates diagrammatically an installation according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

The steam pressure and temperature reducing installation comprises a container **1** with steam and water inlet holes and pipe **2** for the discharge of the cooled and pressure reduced steam. Installed in the steam inlet hole is an outlet pipe **3** of a steam valve A. The outlet pipe **3** is mounted on a body **4** of the steam valve A, provided with an inlet pipe **5**.

The outlet pipe **3** accommodates a seat **6** on which a member **7** rests. The member **7** is mounted on a rod **8**. The rod **8** is articulated to an eccentric **9** of the shaft **10**, the latter being connected to a drive **11**.

The drive **11** is actuated by a regulator **12** actuated by the steam pressure in the container **1**. Besides, the shaft **10** has a further eccentric **13** articulated to one arm of a two-arm lever **14**. The other arm of the lever **14** rests on a roller support **15** which can move along the lever **14**. The roller support **15** is linked mechanically with a drive **16** which is controlled by a temperature regulator **17**. The two-arm lever **14** is articulated to a rod **18** of a water valve B. The rod **18** is provided with a member **19** coacting with the seat in the outlet pipe. An outlet pipe **21** is located on a body **22** of the water valve B which is also provided with an inlet pipe **23**. The outlet pipe **21** communicates through a pipe **24** with the hole for delivering water into the container **1**.

High-pressure steam is delivered into the steam valve A through the inlet pipe 5. The drive 11 actuated by the pressure regulator 12 turns the shaft 10 having the eccentrics 9 and 13. As a result, the rod 8 of the steam valve A and the rod 18 of the water valve B move progressively, lifting the members 7 and 19, respectively, from the seats 6 and 20. This forms clearances between the members 7, 19 and the seats 6 and 20. Steam is fed into the container 1 from the steam valve A through the clearance between the member 7 and seat 6 and through the outlet pipe 3 and the steam pressure is reduced to the required level. Water is admitted into the water valve B through the inlet pipe 23. The water flows from the water valve B through the clearance between the member 19 and seat 20 and through the outlet pipe 21 and pipeline 24 into the container 1 where it cools the steam to the required temperature. During this process a certain relationship is maintained between the clearances regulating the flow of steam and water through the steam valve A and water valve B, respectively.

If the parameters of the steam and water entering the valves A and B change, this results in a corresponding change in the temperature and pressure of the steam discharged from the container 1. In this case the roller support 15 is moved by the temperature regulator 17 along the lever 14, thus changing the lengths of the lever arms, i.e. the relative progressive travels of the rod 8 and 18.

This sets up a new relation between the clearances controlling the flow rate of steam and water through the valves A and B which is required for obtaining the desired temperature of the steam discharged from the pipe 2.

The lever 14 and the support on which the roller 15 is adapted to move are so located and the rod 8 is so connected with the eccentric 9 and the rod 18 with the lever 14 that the steam and water valves should close simultaneously irrespective of the value of the adjustable ratio K.

What is claimed is:

1. An apparatus for delivering steam after controlled reduction of pressure and temperature thereof, comprising: a container having a water-inlet, a steam-inlet, and an outlet; pressure regulator means to reduce steam pressure in the container; a first valve means to vary a cross-sectional area of said steam-inlet and a first rod means coupled to said first valve means to cause operation thereof; a water valve having water-inlet and valve means coupled to a second rod means which is operable to control the water outflow from the water valve, the water valve having an outlet which is connected to said water-inlet of the container; first driving means which is sensitive to steam pressure in the container, the driving means being coupled to said first rod to cause operation thereof; an elongated lever movably supported and having a movable fulcrum means adjacent one end of the lever and articulated at its other end with said first rod means; articulated means at said other end of the lever to transmit movement to said first rod means from said first driving means; temperature sensing means to sense the temperature of the steam in the container; a second driving means sensitive to temperature of the steam in said container, and coupled for shifting said movable fulcrum means along the length of the lever, whereby a ratio of a distance between said movable fulcrum means and said second rod to a distance between said movable fulcrum means and said first rod can be varied by shifting said movable fulcrum means, so as to control said water valve and said first valve for the steam-inlet, and the water valve and said first valve means for the steam inlet can be fully closed simultaneously at any position of the movable fulcrum means.

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