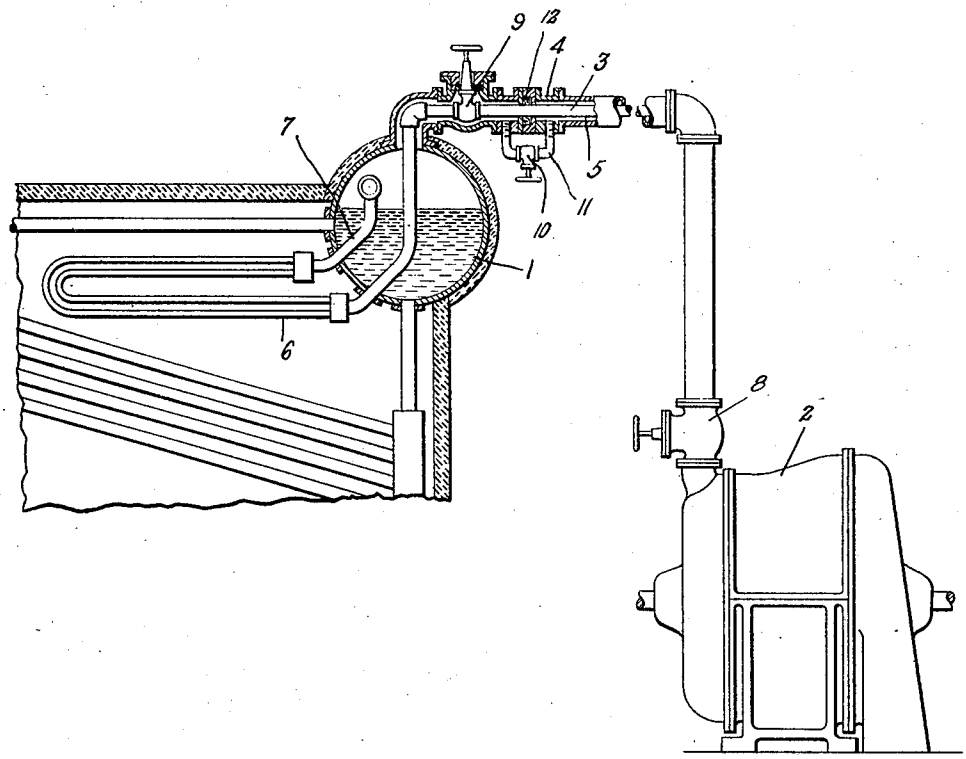
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METHOD OF AND MEANS FOR CONVEYING FLUIDS

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METHOD OF AND MEANS FOR CONVEYING FLUIDS.

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In connection with the production and utilization of fluids of substantial pressure and high temperature, such as for example, highly superheated steam, the problem of the transportation of the fluid from its point of production to its point of utilization is a serious one in that the piping reaches a temperature of a value such that its strength may be impaired and in that, due to the high temperature, the loss of heat by radiation tends to become excessive.

The object of my invention is to provide an improved method of and means or arrangement for conveying fluids of high temperature, and for a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawing, the figure is a diagrammatic view partly in section, of a construction embodying my invention.

Referring to the drawing, the invention is shown as being embodied in a conduit for conveying superheated vapor such as steam, from a boiler 1 to a steam turbine 2, this being a use for which my invention is well adapted. According to the invention, I provide two concentric pipes, an inner pipe 3 and an outer pipe 4, the outer pipe being arranged in spaced relation to the inner pipe whereby there is provided between them an annular conduit 5. Annular conduit 5 communicates at one end with the vapor space of boiler 1. Inner pipe 3 is connected to a superheater 6 which in turn is connected to the vapor space of boiler 1 by a pipe 7. Pipes 3 and 4 as shown provide a conduit means which is being utilized to convey vapor to turbine 2, the admission of vapor to the turbine being controlled by a valve 8 which is to be taken as indicating any suitable valve gear for the turbine. This valve gear for the turbine controls the flow of elastic fluid to the turbine from both the pipe 3 and the conduit 5, the elastic fluid which flows through conduit 5 mixing with that from the pipe 3. In pipe 3 is a control valve 9. The flow of vapor through annular conduit 5 is shown as being controlled by a valve 10 in a by-pass conduit 11 which conveys vapor around a partition wall 12 in annular conduit 5.

With the above described arrangement, pipe 3 carries fluid of a high temperature; for example, it may be superheated steam having a temperature of the order of 750° F. or 1000° F. while the annular conduit 5 carries fluid of substantially lower temperature, for example, steam of a temperature corresponding to saturated steam at the boiler pressure. The pressure in pipes 3 and 4 are substantially equal, the pressure difference at most being only a few pounds. The pressures on the inside and outside of pipe 3, therefore, are substantially the same which means that pipe 3 is not required to withstand a high pressure. This being the case, even though the temperature of pipe 3 were so high that it resulted in impairing the strength of the metal no harm would result. Or viewed from another aspect, since pipe 3 is not required to withstand high pressure, it may be constructed accordingly. In substance, it functions only as a partition wall or shell, defining different temperature zones in the same conduit means. Pipe 4 is subjected to the full boiler pressure. It is the pressure retaining pipe or conduit and provides the mechanical means for confining the fluid. However, since it is conveying steam of moderate temperature, its construction involves no unusual problems. The strength of the material is not affected by high temperature fluid which is carried by the inner pipe or conduit.

The amount of fluid flowing through the respective conduits 3 and 5 is regulated by valves 9 and 10. The amount of fluid it will be desirable to convey through conduit 5 may depend also on the difference in temperatures of the fluids in the two conduits and the length of the conduits.

Since the temperature of the fluid flowing in conduit 5 is substantially lower than that flowing in conduit 3, a material saving in insulation costs will be effected, or if equal insulation is used, then a material saving in radiation losses will result.

In operating, the pressure drop through conduit 5 may be somewhat more than that through pipe 3, but the difference in drop will be provided for by the fact that the pressure in the vapor space of the boiler drum is higher than the pressure at the discharge end of the superheater. Also, the velocity of the fluid in the outer conduit can be regulated so that it is very much lower than the velocity of the fluid in the inner conduit. Con-

sequently, the pressure available for forcing the fluid through the outer conduit is the pressure drop in the superheater and the difference in flow in steam between the inner and the outer conduit.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The method of conveying high pressure fluid having a temperature of an order such that it tends to impair the strength of the conveying means, which comprises conveying the fluid through a conduit surrounded by a conduit conveying fluid under pressure of a similar order but of such lower temperature that the tensile strength of the material of the outer conduit is not reduced below a value sufficient to safely confine the fluid.

2. In the utilization of superheated vapor, the method of conveying it which comprises conveying it through a conduit surrounded by a second conduit through which saturated vapor of substantially the same pressure is carried.

3. The combination with a vapor generator having a vapor drum and a superheater, of means for conveying vapor therefrom comprising concentric conduits, the inner conduit being connected to the superheater, and the outer conduit being connected to the vapor drum.

4. The combination with a vapor generator having a vapor drum and a superheater, of means for conveying vapor therefrom comprising concentric conduits, the inner conduit being connected to the superheater and the outer conduit being connected to the vapor drum, and means connected with the outer conduit for controlling the flow of vapor therethrough.

5. In combination, a double conduit for conveying a high temperature fluid under pressure, comprising an outer conduit having mechanical strength at normal temperatures sufficient to withstand the pressure of the fluid, an inner conduit concentric with the first conduit for conveying the high temperature fluid, and means for supplying a lower temperature fluid to the outer conduit at a pressure substantially equal to that of the high temperature fluid.

6. The method of conveying high temperature elastic fluid under pressure, which comprises conveying the elastic fluid through a conduit and causing the walls of said conduit to be subjected to external pressure by a fluid of substantially the same pressure and of a lower temperature flowing about and along said conduit at a controlled rate, the temperature and rate of flow of said fluid being such that the temperature of the confining means therefor is maintained below a value at and above which its tensile strength is impaired.

7. The method of conveying high temperature elastic fluid under pressure, which comprises conveying the elastic fluid through a conduit which is surrounded by a second conduit and subjecting the first conduit to the temperature and the second conduit to the pressure of the fluid, by passing a fluid of lower temperature and of substantially the same pressure through the second conduit at a controlled rate of flow.

In witness whereof, I have hereunto set my hand this 23d day of November, 1926.

ARTHUR R. SMITH.