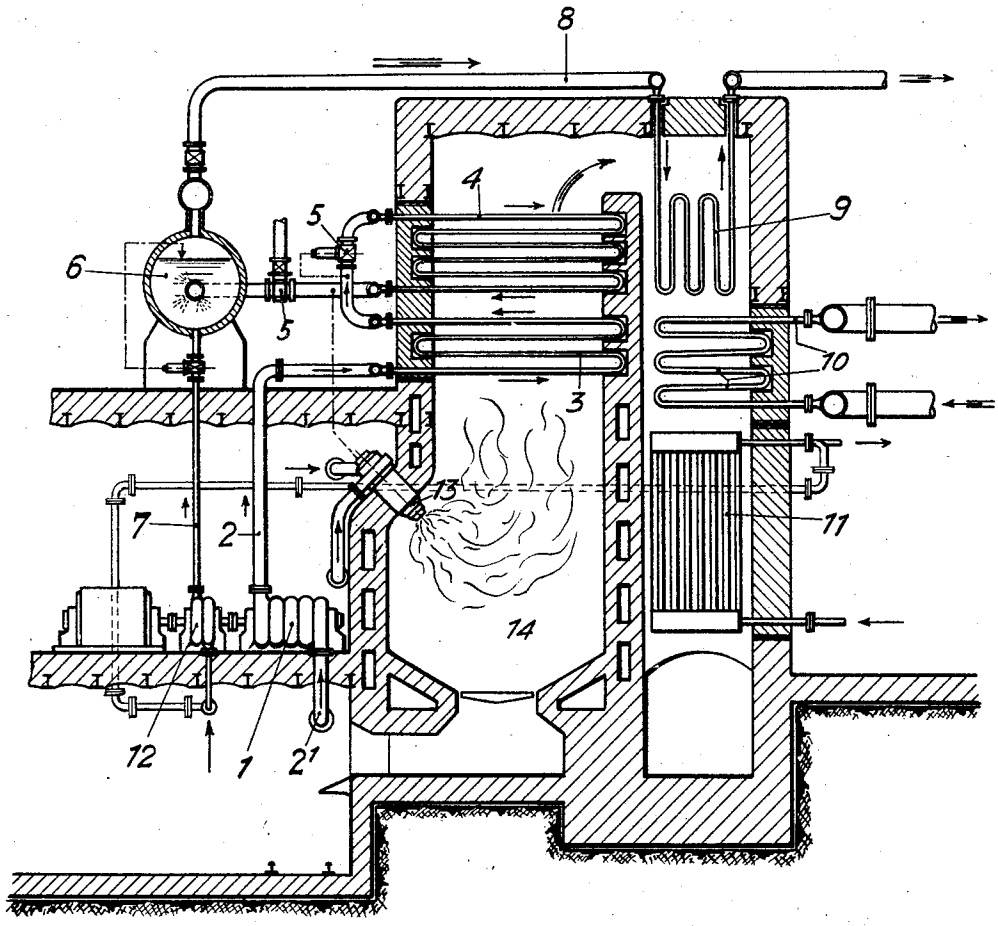
Nov. 18, 1930. F. FLATT 1,781,836

PLANT FOR THE GENERATION OF HIGH PRESSURE STEAM

Filed July 19, 1926



Inventor
Fritz Flatt
By Henry Orth Jr. Atty.

Patented Nov. 18, 1930 1,781,836

UNITED STATES PATENT OFFICE

FRITZ FLATT, OF ZURICH, SWITZERLAND, ASSIGNOR TO THE FIRM AKTIENGESELLSCHAFT DER MASCHINENFABRIKEN ESCHER WYSS & CIE, OF ZURICH, SWITZERLAND

PLANT FOR THE GENERATION OF HIGH-PRESSURE STEAM

Application filed July 19, 1926, Serial No. 123,469, and in Switzerland July 22, 1925.

Plants are already known for the generation of high pressure steam in which the steam, generated in a coil of pipe, is passed directly to the steam consuming means. In such plants only a feed pump and therefore no circulating pump has to be provided. The disadvantage of plants of this type is however, that they do not adapt or accommodate themselves to a sufficient extent to the fluctuations in the load on the steam consuming means as they possess neither water nor steam accumulators. Consequently when the load decreases suddenly there is great risk of explosion, while if the load increases suddenly and greatly too little steam is available. There is also risk, when the load increases suddenly and greatly, that too little heat is immediately transmitted to the coil of pipe so that the steam generated carries with it much water in the form of spray, which first collects in the coil of pipe and may pass afterwards into the heat consuming means proving in many cases injurious thereto.

Plants are also already known for the generation of high pressure steam in which steam is highly superheated in a superheater constructed as a coil of pipe, part being passed from this superheater directly to the steam consuming means while the remainder passes to a water reservoir, where it gives up its superheating heat to the water contained therein and thereby effects a partial evaporation of this latter. The steam thus generated in the water reservoir is then forced into the superheater again by a circulating pump. The advantages of plants of this type are that the superheating of the steam in the coil of pipe is substantially uniform for all loads on the steam consuming means and that no chilling of the tubes by mixtures of steam and water is possible. On the other hand there is great risk of explosion in plants of this type should the circulating pump fail to act properly. This latter also requires a great amount of power to operate it as, in order to overcome the resistance of flow and to produce the necessary high velocity of flow in the super-heater, the steam drawn from the water reservoir has to be compressed to a comparatively high pressure. Furthermore the coefficient of heat transmission on the superheater is small as there is only transference of heat to the superheated steam so that the coil is subjected to accumulations of heat and may very easily be burnt out. Furthermore great superheating surface is necessary, as the whole of the heat of evaporation and superheating has to be taken up in the superheater. A further advantage is that a separate auxiliary boiler has to be provided for starting.

The object of the present invention is therefore to provide a plant which possesses the advantages of the plants above described but not their disadvantages. For this purpose according to this invention the coil of pipe in a plant for the generation of high pressure steam in which heat required for evaporation is taken up in a coil of pipe, is fed by means of a feed pump under high pressure with a fluid taken from a feed pipe and the superheated steam produced in this coil gives up its superheating heat in a water reservoir to the water contained therein, thereby effecting a partial evaporation of the latter. A water feed pipe is also connected to the water reservoir in addition to the coil of pipe.

In the accompanying drawing is diagrammatically shown, by way of example, a construction according to the present invention. In this drawing 1 denotes a feed pump which is supplied with water through a feed pipe 2^1. The pump 1 delivers water under high pressure into a pipe 2, which is provided with the coils 3 and 4 which are exposed to the hot fire gases produced in a burner 13 and to the radiant heat of the furnace 14. In these coils 3 and 4 the heat necessary for evaporation is taken up, and as the pump 1 already delivers at a high pressure into the pipe 2, a comparatively high pressure exists in the coils. The pressure of the steam generated and superheated in the coils 3 and 4 can be regulated and throttled by means of devices 5 and the steam passes into a water reservoir 6, where, by admixture with the water contained therein and partial evaporation of the latter, it gives up its superheating heat and is for the most part condensed. As the steam generated in the coils 3 and 4 is

superheated the thermal content of the steam flowing into the reservoir 6 is so great that even water can be added to this reservoir 6 through a feed pipe 7 directly connected thereto. The steam generated in the water reservoir passes through a pipe 8 into a superheater 9 and thence to a steam consuming device (not shown). In the plant herein described no great superheating surface is necessary, because in the superheater only the superheating heat has to be taken up which it needs to evaporate the liquid flowing in through the pipe 7.

The feed water delivered by the feed pumps 1 and 12 through the pipes 2 and 7 may be previously heated. For this purpose for instance the waste heat of the flue gases may be used as shown in the figure where 11 denotes a feed-water heater heated by waste gases. In the arrangement shown an intermediate superheater 10 is disposed between the superheater 9 and the feed-water heater 11. Whenever possible it is recommended that condensed water be used as the liquid to be fed to the coil of pipe while the reservoir 6 may be fed with fresh water. In the plant described it is quite possible to so arrange the coils 3, 4 that the hottest fire gases come into contact with the coil 3 first, where an exchange of heat takes place much more easily than one between fire gases and superheated steam. On the other hand the coil 4, filled for the most part with superheated steam can be so arranged that it only comes into contact with gases which are already cooled down, so that it is not exposed to any dangerous accumulations of heat.

The plant herein described comprises features per se well known; as however in it all the disadvantage of the plants acknowledged in the introduction to this specification to be already known do not exist, it constitutes an important improvement as it possesses all the advantages of those plants.

I claim:

1. A plant for the generation of superheated high pressure steam, comprising in combination, a furnace, a coil of pipe arranged in the stream of hot fire gases of the furnace, a feed pump to feed water under high pressure to said coil and in which the water is converted into steam and superheated, a water reservoir into which the superheated steam from said coil is led to evaporate a part of the water in said reservoir, means to feed water directly into said reservoir, a superheater connected to said reservoir, and means to lead steam from said superheater to a steam consuming device.

2. A plant for the generation of superheated high pressure steam, comprising in combination, a furnace, a coil of pipe arranged in the stream of the hot fire gases of the furnace, a feed pump adapted to feed liquid under high pressure to said coil of pipe in which the liquid is converted into steam and superheated, a water reservoir into which the superheated steam from said coil of pipe is led for causing evaporation of some of the water contained in said reservoir, means adapted to feed water directly into said reservoir, a superheater heated by the gases of the furnace and connected to said water reservoir for receiving the steam generated in the latter, and a conduit connecting said superheater to a steam consuming device.

3. A plant for the generation of superheated high pressure steam, comprising in combination, a furnace, a coil of pipe arranged in the stream of the hot fire gases of the furnace, a feed pump adapted to feed liquid under high pressure to said coil of pipe in which the liquid is converted into steam and superheated, a water reservoir into which the superheated steam from said coil of pipe is led for causing evaporation of some of the water contained in said reservoir, means adapted to feed water directly into said reservoir, a feed water heater arranged in the current of the waste gases of the furnace and connected to said means, a superheater heated by the waste gases of the furnace and connected to said water reservoir for receiving the steam generated in the latter, and a conduit connecting said superheater to a steam consuming device.

4. A plant for the generation of superheated high pressure steam, comprising in combination, a furnace, a coil of pipe arranged within the range of the hottest fire gases of the furnace, a feed pump to feed water under high pressure to the portion of the coil nearest the fire and in which water is converted into steam and the steam superheated in the portion of the coil therebeyond, a water reservoir into which the super-heated steam from said coil is led to evaporate a part of the water in said reservoir, means to feed water directly into said reservoir, a superheater, and means to lead steam generated in the reservoir to said superheater and thence to a steam consuming device.

5. A plant for the generation of superheated high pressure steam comprising in combination, a furnace, a coil of pipe arranged within the range of the hottest fire gases of the furnace, a feed pump to feed condensed water under high pressure to the portion of the coil nearest the fire and in which water is converted into steam and the steam superheated in the portion of the coil therebeyond, a water reservoir into which the superheated steam from said coil is led to evaporate a part of the water in said reservoir, means to feed fresh water directly into said reservoir, a super-heater beyond said coil, and means to lead steam generated in the reservoir to a steam consuming device through said superheater.

6. A steam generating plant, comprising a

furnace, a coil of pipe arranged within the range of the hottest fire gases of the furnace, a feed pump to feed condensed water under high pressure to a portion of said coil nearest the fire and in which the water is converted into steam and the steam superheated in the coil therebeyond, a water reservoir into which the superheated steam from said coil is directly led to evaporate part of the water therein by the superheating heat carried by the steam while condensing but a portion of such steam, means to feed fresh water directly into said reservoir, a superheater beyond said coil and reservoir and connected to the latter, and means to conduct steam from the superheater to a steam consuming device.

In testimony whereof, I have signed my name to this specification.

FRITZ FLATT.