

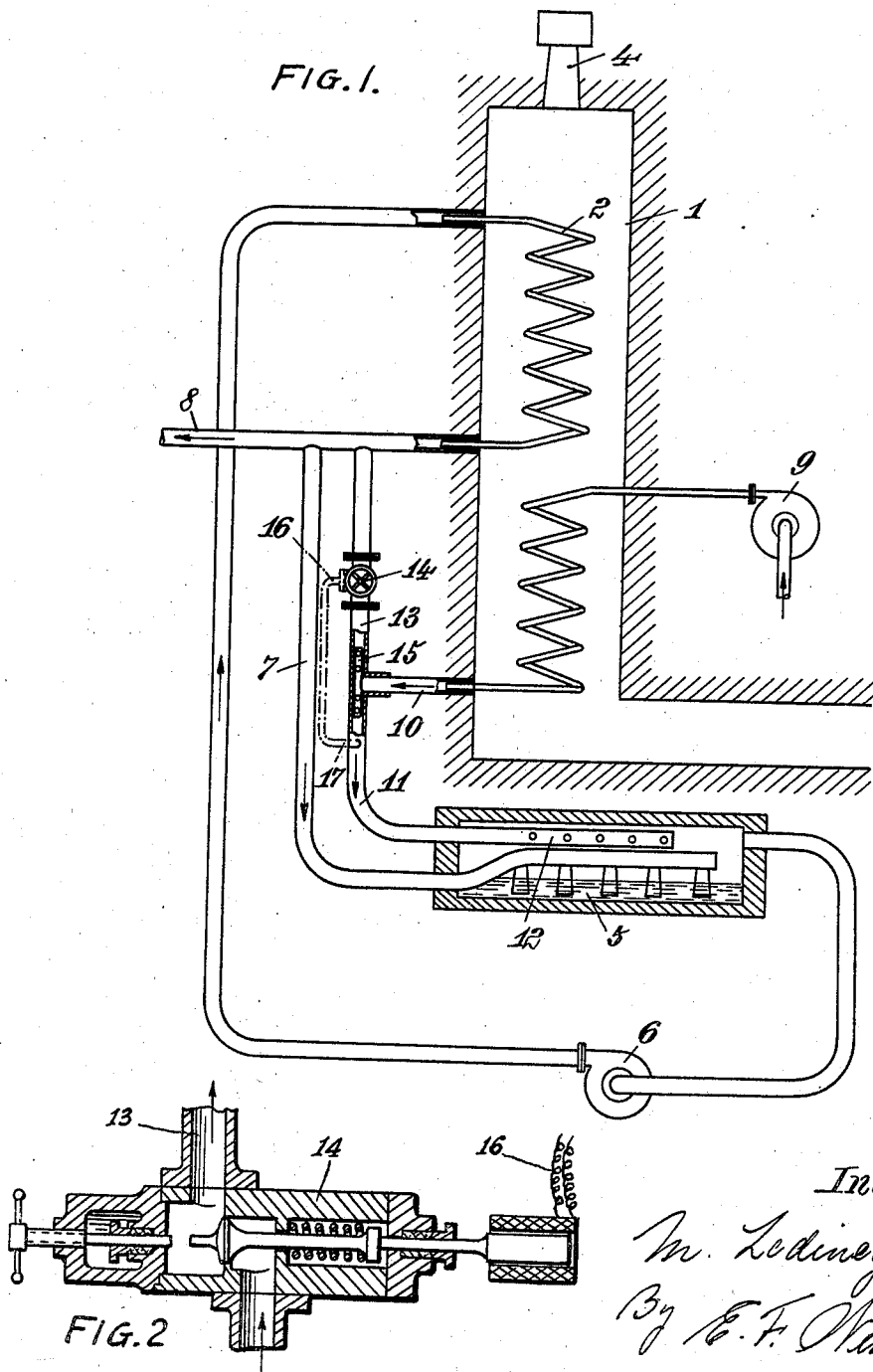
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METHOD OF HIGH PRESSURE STEAM GENERATION

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METHOD OF HIGH PRESSURE STEAM
GENERATION

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The invention relates to high pressure steam generators with boiler drums and to the generation of steam by injecting into the water to be evaporated superheated steam which preferably is maintained in circulation. The object of the invention is to effect a material increase in the capacity of such boilers in excess of normal load and to reduce the cost of constructing boilers for high peak loads. In accordance with the invention, this object is attained by means of the method of generating steam which is described below.

Only a part of the superheated steam serving as heating medium is introduced into the water space of the boiler drums. The other part, which preferably is regulable, is mixed with the feed water before the latter enters the boiler drums and the resulting water-steam mixture is introduced into the steam space of the boiler drums. The superheated steam is preferably divided in dependence upon the consumption of steam from the boiler of a suitable magnitude indicative thereof, and in the case of boilers with steam circulation the division may be effected in dependence upon the quantity passing through the circulating pump. This regulation is advantageously effected in such manner that above the normal load of the system, the quantity of superheated steam introduced into the water space of the boiler drums is maintained constant and the admixture of superheated steam with the feed water flowing to the boiler drums is not commenced until the load exceeds the normal load. The resulting distribution of the superheated steam is then preferably also controlled in dependence upon the quantity of feed water flowing into the boiler or a magnitude dependent thereon, in such manner that independently of the values of other magnitudes, the quantity of superheated steam admixed with the feed water prior to entering the boiler drums cannot exceed a certain upper limit.

The capacity in excess of normal load can be still further increased by introducing the mixture obtained from the entire quantity of the feed water and the corresponding part of the superheated steam into the boiler drums so as to be distributed over the entire extent of the water surface.

Figure 1 is a diagrammatic view illustrating the invention, and

Figure 2 is an enlarged cross sectional view of a valve.

In the accompanying drawing, the method of generating steam according to the invention is shown by way of example as applied to Löffler

boilers. 1 is the heating surface system including the steam superheater 2 and the feed water preheater 3 heated by the burner 4, 5 is the boiler drum and 6 the steam circulating pump of the Löffler system. 7 is the superheated steam conduit leading to the water space of the boiler drum 5 and 8 is the conduit through which the working steam is drawn off. The feed water which the pump 9 conveys through the preheater 3 is introduced into the boiler drum 5 through the conduits 10 and 11. The conduit 11 terminates in a distributor tube 12 in the steam space of the boiler drum 5. Connected in parallel with the superheated steam conduit 7 leading to the boiler drum 5 is a second superheated steam conduit 13 with regulating device 14 which leads to the conduit 11 and thus to the steam space of the boiler drum 5. At the junction of this superheated steam conduit 13 with the conduit 11 the feed water conduit 10 terminates in a sprinkler 15 or the like which allows the feed water to enter the conduit 11 in finely divided form. The part of the superheated steam controlled by the regulating device 14 mixes with the feed water at this point and in fact with the entire quantity of the feed water and evaporates a corresponding part thereof. The resultant water-steam mixture is introduced into the steam space of the boiler drum 5 through the conduit 11 and there is sprayed on the water surface over the entire extent thereof from the tube 12 through corresponding nozzles or the like. The water then passes to the water space and the steam together with the steam generated in the drum 5 is again drawn off by the circulating pump 6.

The regulating member 14 is most simply and conveniently constructed as a valve which commences to open under the reduced pressure occasioned by the circulating pump 6 when the normal load is exceeded and then continues to open in dependence upon the pressure difference so that the entire quantity of superheated steam requisite as heating medium for producing the quantity of steam in excess of the normal load, passes into the conduit 13. Up to normal load the boiler operates purely on the Löffler principle and above normal load the entire quantity of steam in excess of normal load is generated from the feed water prior to entering the boiler drum 5.

As indicated by the conduit 16, the setting of the regulating member 14 is also supervised by the member 17 which responds to the temperature in the conduit 11, more particularly on exceeding the saturated steam temperature at which said member 17 is preferably preliminarily set, in such

manner that independently of the adjustment in dependence upon other magnitudes, the part of the superheated steam passing through the conduit 13 cannot exceed an upper limit at any time and the conduit 13 is completely shut off if no feed water is introduced.

By means of this new method it is attained that the boiler drums, which as is known represent a very considerable portion of the cost of manufacture of the boiler, no longer need to be dimensioned in accordance with the maximum capacity of the boiler but only for a fraction thereof. With the mode of control set forth the boiler drums need be dimensioned only for the normal load on the boiler. In spite of the normal load being exceeded, the load on the water surface in the boiler drums does not increase. At the same time all advantages of steam generation with superheated steam as heating medium are retained. In particular in the case of Löffler boilers the purity of the steam generated is not detrimentally affected. In that in accordance with the invention only part of the superheated steam is mixed with a large quantity or the entire quantity of the feed water for evaporation outside the boiler drums, no impurities can pass from the water into the steam, because the water is in great excess in comparison with the steam so that the impurities remain in the water where they merely accumulate correspondingly. At the same time a very rapid cooling of the superheated steam is ensured.

The reduction in size of the boiler drums permitted by the present method, affords a material economy in space and weight.

Throughout the specification diverse variations have been set forth; this invention is not to be limited to the precise details, but is to include within the scope of the accompanying claims all such equivalent constructions as may be possible to accomplish the same results in substantially the same way.

What is claimed is:

1. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the water to be evaporated in boiler drums consisting in dividing the superheated steam, introducing one part into the water space of the boiler drums, mixing the other part with feed water in such proportion that a production of steam takes place and introducing the mixture into the steam space of the boiler drums.

2. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the water to be evaporated in boiler drums consisting in dividing the superheated steam, introducing one part into the water space of the boiler drums, mixing the other part with the feed water in such proportion that a mixture of water and steam is produced and introducing this mixture of water and steam into the steam space of the boiler drums.

3. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the water to be evaporated in boiler drums consisting in dividing the superheated steam, introducing one part into the water space of the boiler drums, mixing the other part with the total amount of the feed water before its entry into the boiler drums, this part of the superheated steam being so dimensioned, that a production of steam takes place, and introducing

the produced mixture of water and steam into the steam space of the boiler drums.

4. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the water to be evaporated in boiler drums consisting in dividing the superheated steam, introducing one part into the water space of the boiler drums, mixing the other part with the feed water in such proportion that a mixture of water and steam is produced, introducing this mixture into the steam space of the boiler drums and at boiler ratings above normal load, keeping that part of the superheated steam constant, which is introduced into the water space of the boiler drums.

5. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the water to be evaporated in boiler drums consisting in dividing the superheated steam, introducing one part into the water space of the boiler drums, mixing the other controllable part with the feed water in such proportion that a mixture of water and steam is produced and introducing this mixture of water and steam into the steam space of the boiler drums.

6. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the water to be evaporated in boiler drums consisting in dividing the superheated steam, introducing one part into the water space of the boiler drums, mixing the other controllable part with the feed water in such proportion that a mixture of steam and water is produced, introducing this mixture into the steam space of the boiler drums and at boiler ratings above normal load, keeping that part of the superheated steam constant, which is introduced into the water space of the boiler drums.

7. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the water to be evaporated in boiler drums consisting in dividing the superheated steam in cases of excessive load introducing that part of the superheated steam, which is requisite as heating medium for generating the normal load portion of the useful steam, into the water space of the boiler drums, mixing the other part with the feed water in such proportion that a mixture of steam and water is produced and introducing this mixture of water and steam into the steam space of the boiler drums.

8. A method according to claim 2, in which the mixture of steam and water is sprayed onto the water level in the boiler drums.

9. A process according to claim 2 wherein the quantity of superheated steam admixed with the feed water prior to the entry into the boiler drums is varied in proportion to the amount of feed water.

10. A process according to claim 2 wherein the quantity of superheated steam admixed with the feed water prior to the entry into the boiler drums is controllable and is corrected in proportion to the amount of feed water in such a manner that the quantity of superheated steam proportional to the feed water rating forms the upper limit.

11. A method for producing high pressure steam by introducing superheated and more particularly circulated superheated steam serving as a heat carrier into the boiler drums consisting in dividing the superheated steam, at a certain pre-

determined pressure, introducing one part of the same into the water space of the boiler, introducing the other part divided off at a certain predetermined pressure into a space for admixture with feed water before its entry into the boiler drums in such proportion that a production of steam takes place and introducing the mixture of water and steam into the steam space of the boiler drums.

12. A method for producing high pressure steam by introducing superheated circulated

steam into the water to be evaporated in boiler drums consisting in dividing off a part of the superheated steam by a controlling element opening at a predetermined steam pressure, admixing the same with feed water in such a manner that a mixture of water and steam is produced, introducing this mixture into the steam space of the boiler drums and introducing the remaining quantity of the superheated steam into the water space of the boiler drums.

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