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HOT WATER BOILER FOR FORCED CIRCULATION HEATING SYSTEMS

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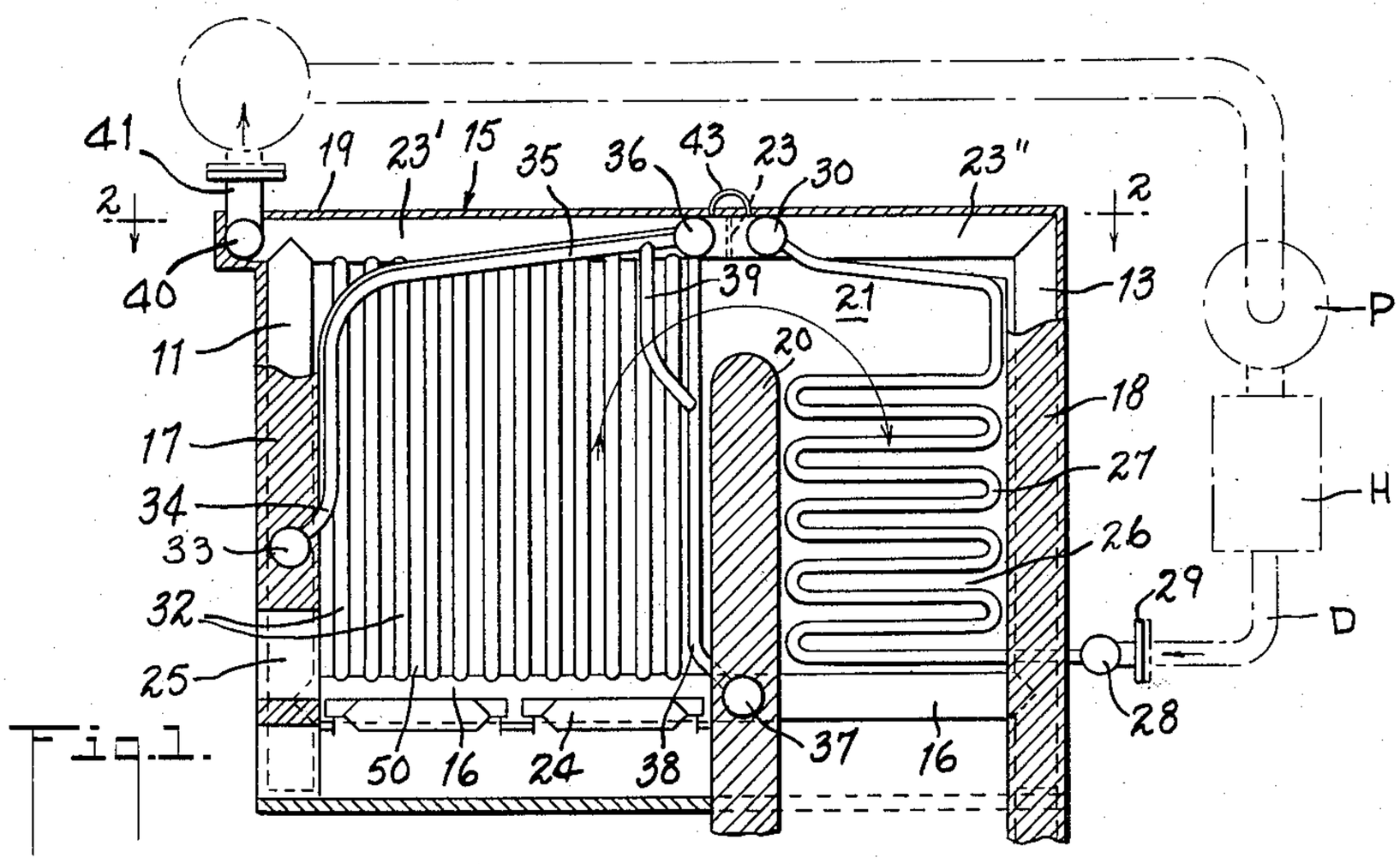


Fig. 1.

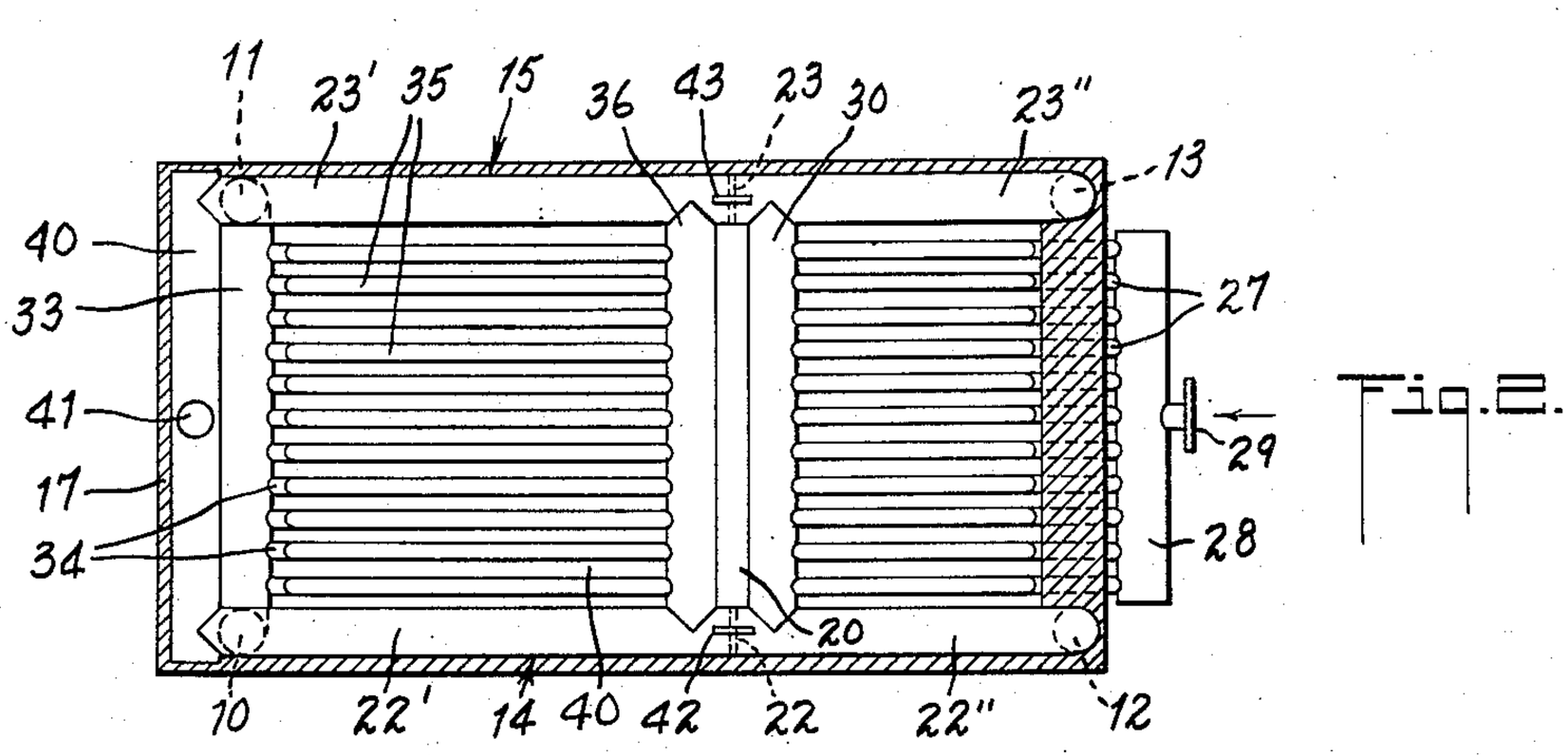


Fig. 2.

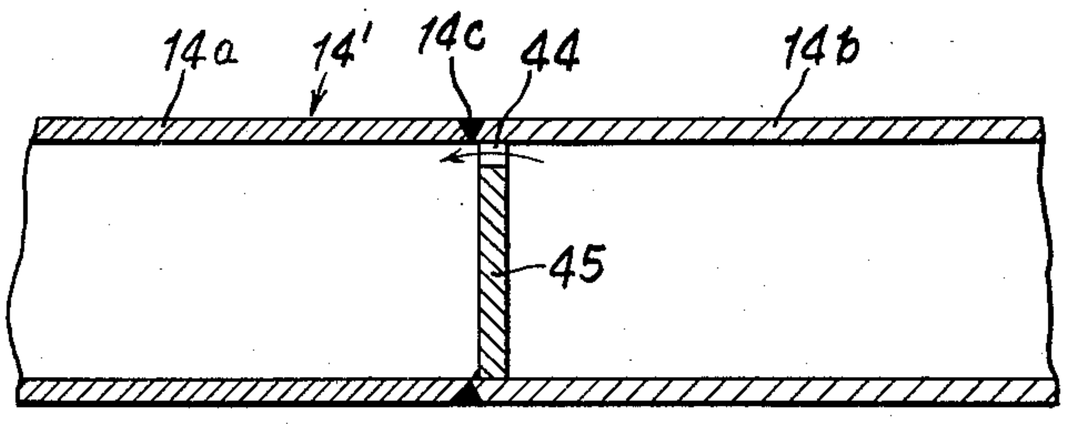


Fig. 3.

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# HOT WATER BOILER FOR FORCED CIRCULATION HEATING SYSTEMS

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5 Claims. (Cl. 122—235)

The invention relates to a hot water boiler for a heatinp system with forced circulation and more particularly to a hot water boiler with a tubular framework and two tubular heating surfaces, one of which being formed of slightly heated serpentine tubes and the other one being formed of tubes intensely heated, chiefly by radiation.

In a certain conventional type of such boilers, the return water from the heating system is conducted first through the serpentine tubes into a collector from where it is led to the distributor of the intensely heated tubes. Such assembly has the disadvantage that a special conduit is required between the mentioned collector and distributor. In other conventional boilers, the water from the slightly heated tubes is conducted directly into the collector of the intensely heated group of tubes which causes the drawback that the temperature of the water supplied to the heating system is lower than that of the intensely heated group of tubes and the danger exists that steam may form so as to cause strong condensation noises or even servere water-hammer where the cooler water is fed into the mixing zone.

The invention aims to aviod the drawbacks of the conventional boiler types and essentially aims to provide upper longitudinal elements of the tubular framework with partitions so that each upper longitudinal element has two parts into one of which the water from the serpentine tubes enters and into the other one of which the water from the intensely heated tubes is fed.

Further objects and details of the invention will be apparent from the description given hereinafter and the accompanying drawing illustrating an embodiment thereof by way of example.

In the drawing:

Fig. 1 is a longitudinal section of a boiler according to the invention;

Fig. 2 is a section along line **2—2** of Fig. 1 and

Fig. 3 is a cross-section of a modified part.

Referring now to the drawing, the illustrated boiler has a framework comprising front corner tubes **10** and **11**, rear corner tubes **12** and **13**, upper longitudinal tubes **14** and **15** and lower longitudinal tubes **16** of which only one is visible in the drawing. The longitudinals communicate with the corner tubes to which they are connected. Thus, the one boiler side wall contains the tubes **10, 12, 14** and one tube **16**, and the other side wall contains the tubes **11, 13, 15** and the other tube **16**. The front wall of the boiler is denoted by **17**, the rear wall by **18** and the ceiling wall by **19**. A partition **20** extends upwards intermediate the walls **17** and **18** so as to leave a passage **21** between its top and the ceiling wall **19**. Substantially in the vertical median plane of the partition **20**, the upper longitudinal tubes **14** and **15** are provided with partitions **22** and **23**, respectively, dividing the longitudinals in parts **22′**, **22″** and **23′**, **23″**, respectively. Contrary thereto, the lower longitudinal tubes **16** extend undivided, i. e. without any partition from the adjoining front corner tubes to the rear corner tubes of the same sides, respectively. The furnace or combustion



space **50** extends between the front wall **17** and the partition **20**. The grate **24** and charging opening **25** are visible in Fig. 1. A flue space **26** is formed between the partition and the rear wall **18** and communicates with the furnace through the passage **21** for the combustion gases.

A convection heating surface comprising the serpentine tubes **27** is located in the flue space **26**. The tubes **27** extend from a distributor **28** with inlet socket **29** upwards to a collector **30** which, in fact, is a transverse tube connected to and communicating with the longitudinal tube parts **22″** and **23″** close to the partitions **22** and **23**. However, it is also possible to connect the tube **30** to the longitudinal parts **22″** and **23″** at points closer to the corner tubes **12** and **13**.

Radiantly heated vertical tubes **32** extend between the lower longitudinal tubes **16** and the parts **22′** and **23′** of the upper longitudinals. At a relatively short distance above the front wall opening **25**, a transverse tube **33** is connected between the front corner tubes **10** and **11**. This tube **33** constitutes a distributor for radiantly heated front wall tubes **34** which are bent in their upper parts **35** so as to form ceiling tubes. These front and ceiling tubes open into a transverse collector **36** which is connected to the upper longitudinal parts **22′** and **23′** close to the partitions **22** and **23**. Another transverse distributor **37** connecting the lower longitudinals **16** is located in the partition **20**. From distributor **37**, rear wall tubes **38** extend and open into the aforementioned transverse collector **36**. Upper branches **39** of the tubes **38** may be provided and connected directly to the ceiling tubes **35**. Another transverse tube **40**, forming part of the boiler frame, communicates with the upper ends of the front corner tubes **10** and **11** and the front ends of the upper longitudinal tubes **14, 15**. Tube **40** has an outlet socket **41** from which hot water may be supplied to a heating system H with its circulating pump P. The pump P, system H and discharge conduit D of the return water are no parts of the present invention.

If now the whole heating system is connected between the sockets **41** and **29**, the return water will flow through the distributor **28**, serpentine tubes **27**, collector **30**, longitudinal parts **22″** and **23″**, down the rear corner tubes **12** and **13** into the longitudinal distributor tubes **16**. From there a portion of the water flows through the radiantly heated side, wall tubes **32** directly to the upper longitudinal tube portions **22′** and **23′**, whereas other portions flow through the transverse distributors **33** and **37**, tubes **34, 35** and **38, 39** to the transverse collector **36** which opens also into the portions **22′** and **23′** from where all the heated water is supplied to the heating system through the transverse tube **40** and socket **41**.

Thus, a mixing of the cooler water from the slightly heated group of tubes with the water from the intensely heated group will be avoided so that no condensation noises or even water-hammer can occur. The invention has the further advantage that no special conduit is required in order to conduct the water from the serpentine tubes to the distributors for the radiantly heated tubes. Another advantage of the invention consists in that a natural circulation can take place in the radiantly heated system if the flow through the heating system is interrupted, as the hot water can flow down from the upper collector tube portions **22′** and **23′** through the front corner tubes to the longitudinal distributors **16** and the transverse distributors **33** and **37**.

It will be noted that in the regular operation of the boiler, the connections between the transverse collector **30** and the longitudinal portions **22″** and **23″** are the highest points of the paths of the water coming from the serpentine tubes. In consequence, there is the possibility of air collecting at these points. In order to prevent the

formation of such air pockets, deaerating tubes **42**, **43** may be provided which connect the portions **22'**, **22''** and **23'**, **23''**, respectively. Then, the current of water flowing in the direction from the partitions **22** and **23** towards the outlet socket **41** will entrain any air from the tube portions **22''** and **23''**.

Instead of the deaerating tubes **42**, **43** small holes **44** may be provided in the partitions **45** of the upper longitudinal tubes, as shown with respect to the tube **14'** in Fig. 3. This figure also indicates that the tube **14'** consists of two pieces **14***a* and **14***b*, welded together at **14***c* in order to render the installation of the wall **45** possible.

It will be apparent to those skilled in the art that many alterations and modifications of the structure shown and hereinbefore described can be made without departure from the essence and spirit of my invention which, for that reason, shall not be limited but by the scope of the appended claims.

I claim:

1. In a hot water boiler for heating system with forced circulation and including a pump, the combination of a tubular boiler framework including two upper and two lower longitudinal tubes and two front and two rear corner tubes connecting each the ends of an upper and a lower one of said longitudinal tubes, a partition in each of said upper longitudinal tubes so as to divided each of said tubes in a front and a rear part, each lower longitudinal tube extending undivided through between the connected front and rear corner tubes, a distributor adapted for connection with said heating system so as to receive return water therefrom, a heating surface including a transverse collector tube connected between said rear parts of said upper longitudinal tubes and a set of slightly heated serpentine tubes connected between said distributor and said transverse collector, and another heating surface including tubes intensely heated predominantly by radiation and connected with said front parts of said upper longitudinal tubes and with said lower longitudinal tubes, and means for connecting said front parts to the inlet side of said heating system.

2. In a hot water boiler for a heating system with forced circulation and including a pump, the combination of a tubular boiler framework including two upper and two lower longitudinal tubes and two front and two rear corner tubes connecting each the ends of an upper and a lower one of said longitudinal tubes, a partition in each of said upper longitudinal tubes so as to divide each of said tubes in a front and a rear part, each lower longitudinal tube extending undivided through between the connected front and rear corner tubes, a convection heating surface including a set of serpentine tubes, a distributor connected to said serpentine tubes and adapted for connection with said heating system so as to receive return water therefrom, and a transverse collector connected to said serpentine tubes and also connected to said rear parts of said upper longitudinal tubes, and a second heating surface including radiantly heated vertical tubes extending between said front parts of said upper longitudinal tubes and said lower longitudinal tubes, and an upper transverse tube connecting the front parts of said upper longitudinal tubes and being adapted for connection with said heating system so as to supply hot water thereto, whereby said lower longitudinal tubes constitute the distributors and said front part of said upper longitudinal tubes constitute the collectors for said radiantly heated tubes.

3. A boiler as claimed in claim 2, further comprising another upper transverse tube connecting said upper longitudinal tubes closely to said partitions, a lower transverse tube connecting said lower longitudinal tubes substantially near a vertical plane through said other upper transverse tube, another set of radiantly heated tubes between said other upper transverse tube and said lower transverse tube, another lower transverse tube connected to and extending between said front corner tubes at a distance from said lower longitudinal tubes, and a third set of radiantly heated tubes forming front and ceiling tubes and extending from said other lower transverse tube to said other upper transverse tube.

4. A boiler as claimed in claim 2, further comprising a deaerating tube for each upper longitudinal tube, said deaerating tube connecting said front and rear parts of the associated longitudinal tube closely to said partition thereof.

5. A boiler as claimed in claim 1 wherein each partition is provided with a small hole in its uppermost portion.

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