Feb. 4, 1930. I. HARTER 1,745,485

FLUID HEATER

Filed Dec. 10, 1925

Fig 1

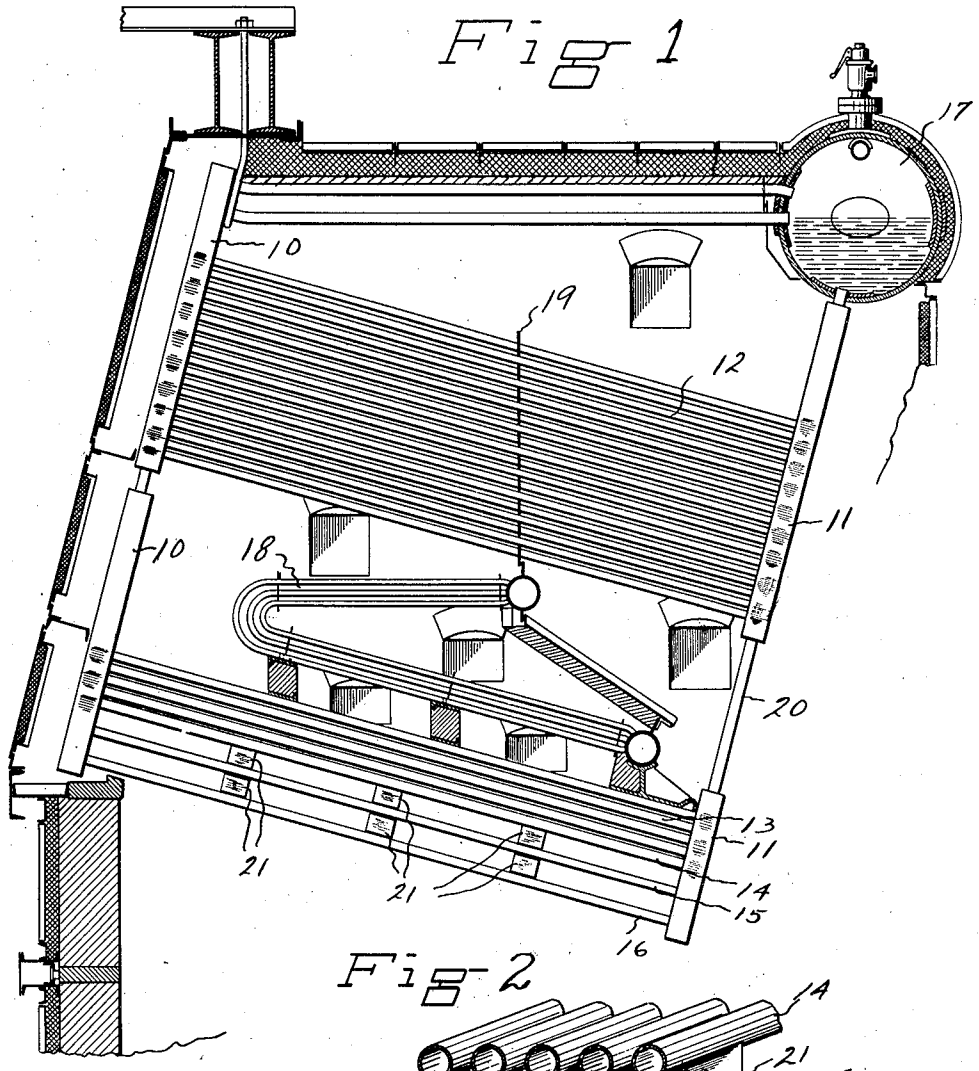
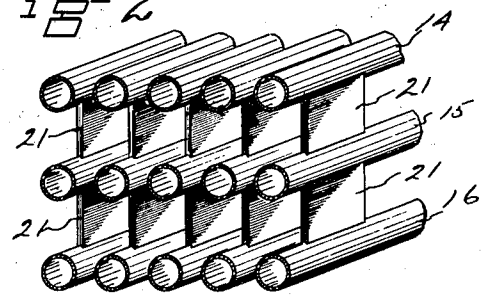


Fig 2



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UNITED STATES PATENT OFFICE

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FLUID HEATER

Application filed December 10, 1925. Serial No. 74,433.

My present invention relates to fluid heaters, such as steam boilers and the like, and particularly to means for preventing the sagging of tubes in such heaters. My invention will be best understood from the following description and the annexed drawings in which Fig. 1 is a side sectional view of a part of a steam boiler of a well-known type which I have adopted for purposes of illustration and showing one form of my invention, and Fig. 2 is a perspective view of a part of Fig. 1.

Like reference characters indicate like parts throughout the drawings.

In the illustrative embodiment, uptake headers or chamber 10 and downtake headers or chambers 11 are connected to a steam and water drum 17 in the usual manner. An upper bank of tubes 12 and a lower bank of tubes 13, preferably horizontally extending as shown, are connected to the headers, rows 15 and 16 being widely spaced from each other and from the lower row 14 of the bank 13. Preferably rows 14, 15 and 16 are not staggered, but are arranged so that a tube of one of these rows is directly below a tube of the next higher row, in order to more effectively screen out the slag particles rising with the furnace gases. The gases flow over the lower bank of tubes, then over the superheater, then between headers 10 and the baffle 19 and then down over the downtake ends of the tubes 12 to the gas outlet between the nipples 20.

In such arrangements, the lower tubes are subjected to intense heat and are usually of considerable length. They are therefore liable to sag if unsupported between their ends. In the illustrative embodiment, this sagging is limited, if not entirely obviated, by providing a plurality of thin metallic plates 21 along the length of each of the tubes in the lower rows and between the ends of the tubes, such plates being welded to each of a pair of tubes in adjacent rows. By this means, each pair of tubes becomes a kind of beam of a depth equal to the distance between the top of the upper tube and the bottom of the lower tube, which obviously will provide a greater resistance to sagging than if the tubes were not connected. Moreover, by making a good thermal connection to the relatively cool tubes, the plates can be maintained at a temperature which will retard their burning out. Such plates will not interfere with the flow of the gases, particularly where the tubes are not staggered, as in the arrangement illustrated. Such plates, as illustrated, preferably lie in the plane passing through the axes of the two tubes. By arranging the plates in this manner, the tubes serve as a screen for the metallic plates from the direct heat of the furnace.

While preferably I weld the plates to the tubes, as by autogenous welding, some of the benefits of my invention may be obtained by clamping the plates or other connecting members to the tubes. It will also be understood that the embodiment of my invention may be widely varied.

I claim:

1. In a fluid heater, chambers spaced apart, a plurality of rows of tubes having their ends connected to said chambers, with the rows spaced apart, and a thin metallic plate located between said chambers and between a tube of one row and a tube of a row spaced therefrom and fixedly connected to each of said tubes.

2. In a fluid heater, chambers spaced apart, a plurality of rows of tubes having their ends connected to said chambers, with the rows spaced apart, and a thin metallic plate located between said chambers and between a tube of one row and a tube of the next adjacent row and welded to each of said tubes.

3. In a fluid heater, chambers spaced apart, a plurality of rows of tubes having their ends connected to said chambers, with the rows spaced apart and each tube of one row directly opposite a tube of another row, and a plurality of thin metallic plates located between said chambers and each plate fixedly connected to a tube of one row and the directly opposite tube of another row.

4. In a fluid heater, chambers spaced apart, a plurality of rows of tubes having their ends connected to said chambers, with the rows spaced apart and each tube of one row directly opposite a tube of the next adjacent row, and a plurality of thin metallic plates located between said chambers and

each plate welded to a tube of one row and to the directly opposite tube of another row.

5. In a fluid heater and a furnace therefor, a plurality of rows of tubes subjected to the heat of the furnace, and a metallic plate located between a tube of one row and a tube of a higher row intermediate the ends of said tubes, said plate extending longitudinally of said tubes and fixedly connected to each of them.

6. In a fluid heater and a furnace therefor, a plurality of rows of tubes subjected to the heat of the furnace, the tubes of one row being arranged directly above the tubes of a lower row, and a metallic plate located between a tube of one row and a tube of a higher row intermediate the ends of said tubes, said plate extending longitudinally of said tubes and fixedly connected to each of them.

7. In a fluid heater and a furnace therefor, a plurality of rows of horizontally extending tubes subjected to the heat of the furnace, and a metallic plate located between a tube of one row and a tube of a higher row, said plate lying in the plane of the axes of the two tubes and located intermediate the ends thereof, said plate extending longitudinally of said tubes and fixedly connected to each of them.

8. In a fluid heater and a furnace therefor, a pass for the flow of heating gases through said furnace, a plurality of spaced apart rows of substantially horizontal tubes extending across said pass, bracing means located in a plane including the axes of separate vertically spaced tubes for rigidly connecting said tubes at a succession of points within said plane so as to provide a beam-like unitary structure in which the resistance to sagging of each of said tubes is materially increased, said means being constructed and arranged to permit free flow of gases past said tubes.

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