Sept. 29, 1931. H. B. SMITH 1,825,289

WASTE HEAT BOILER

Filed Aug. 25, 1927

Fig 1

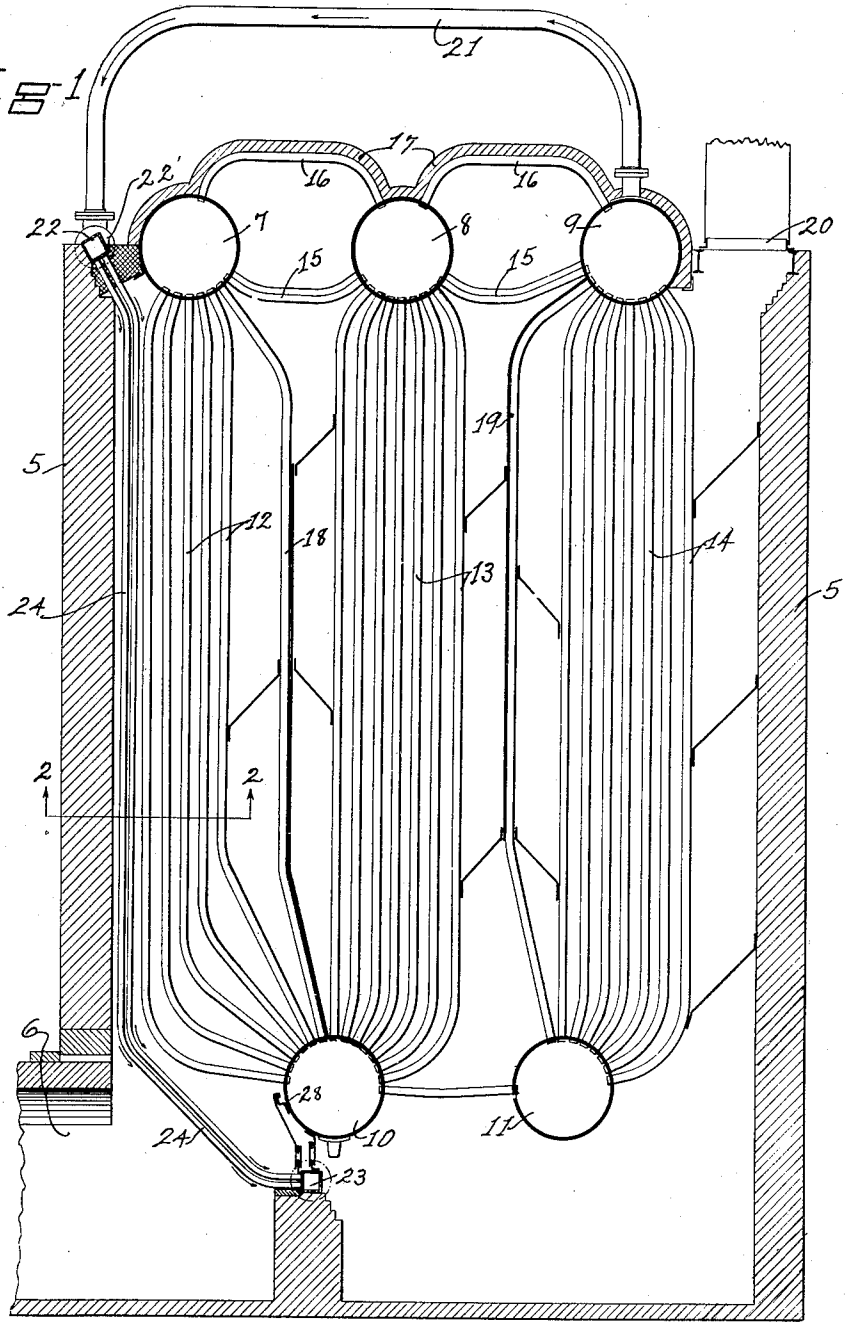


Fig 2

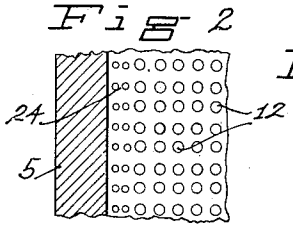
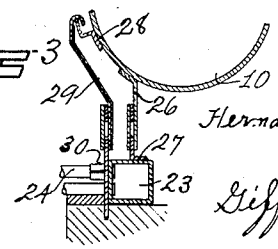


Fig 3



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Patented Sept. 29, 1931 1,825,289

UNITED STATES PATENT OFFICE

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WASTE HEAT BOILER

Application filed August 25, 1927. Serial No. 215,314.

This invention relates to a waste heat boiler in which a superheater is located in such a position that hot gases will pass longitudinally along the tubes of the super-heater. The invention will be understood from the description in connection with the accompanying drawings, in which Fig. 1 is a vertical section through an illustrative embodiment of the invention; Fig. 2 is a section along the line 2—2 of Fig. 1, and Fig. 3 is a section partly broken away and on an enlarged scale, showing one of the details.

In the drawings, reference character 5 indicates the walls of a boiler enclosing upper and lower drums and banks of tubes connecting the drums. A conduit 6 leads to the lower portion of the boiler from a source of waste gases, such as cement kilns, for example (not shown).

The invention is illustrated in Fig. 1 in connection with a Stirling type of boiler, in which the upper steam and water drums 7, 8 and 9 are shown connected to lower mud drums 10 and 11 by banks of tubes 12, 13 and 14. The upper drums are connected to each other by rows of circulating tubes 15 and steam equalizing tubes 16, the steam equalizing tubes being located immediately beneath the roof 17 of the boiler. Baffles 18 and 19 are provided to guide the hot gases that enter through the conduit 6 over the banks of tubes in a generally longitudinal direction along the tubes themselves, and a gas outlet 20 for the spent gases leads to a stack or the like.

A superheater is located inside the walls of the boiler in front of the bank of tubes 12. A steam connection 21 leads from the steam space of the drum 9 to the inlet header 22 of the superheater that is located near the upper edge of the wall 5. The inlet header 22 is connected to the outlet header 23 of the superheater by one or more rows of tubes 24 that extend for a portion of their lengths substantially parallel to the tubes 12 and at their lower ends extend across the inlet or conduit 6, so that the hot gases pass for the most part longitudinally of the superheater tubes. It has been found that when hot gases that may be laden with dust pass longitudinally of the tubes, there is very little, if any, tendency for the dust to deposit upon the outside of the tubes. The lower portions of the tubes 24 across which the dust-laden gases pass, are accessible so that that portion of these tubes can be readily cleaned when dust deposits thereon.

The upper header 22 of the superheater is protected by a layer of insulating material 22′ and a gas seal is provided between the lower header 23 and the drum 10. This gas seal comprises a plate 26 (Fig. 3) attached to the drum 10 and an L-shaped plate 27 attached to the header 23. The side of the plate 26 and a flange of the plate 27 contact with each other and are adapted to slide against each other so as to permit relative movement of the drum 10 and header 23 with respect to each other due to expansion and contraction. A Z-bar 28 is also atached to the drum 10 and a plate 29 having a bent-over upper edge is suspended upon the bar 28. The lower edge of this plate contacts with and is adapted to slide along one side of a plate 30 that is also attached to the header 23, thus aiding in providing a gas seal between the header 23 and the drum 10.

It will be observed that the hot gases passing over the outside of the tubes 24 of the superheater are counter-current to the direction of the steam that is passing through the tubes. These tubes 24 are preferably spaced sufficient distances apart to permit removal of the boiler tubes 12 therebetween. For this reason, it is preferable to place a tube of one row of the tubes 24 in alignment with the tube or tubes of the other row or rows thereof, as shown for example in Fig. 2.

I claim:

1. In a waste heat boiler, upper and lower drums connected by banks of tubes, means for passing hot gases longitudinally along said tubes, and a superheater having tubes located in front of one of said banks and substantially parallel thereto, said superheater having a header located in proximity to one of said lower drums.

2. In a waste heat boiler, upper and lower drums connected by banks of tubes, means for passing hot gases longitudinally along

said tubes, a superheater having tubes located in front of one of said banks and substantially parallel thereto, said superheater having a header located in proximity to one of said lower drums, and a sliding gas seal between said header and drum.

3. In a boiler, upper and lower drums connected by banks of tubes, means for passing hot gases longitudinally along said tubes, and a superheater having tubes located in front of one of said banks and substantially parallel thereto, said superheater being so arranged that all of the hot gases flow over said superheater tubes before contacting with the boiler tubes.

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