March 9, 1943. L. J. MARSHALL 2,313,251

ASH DEFLECTING BAFFLE

Filed May 8, 1941

Fig. 2

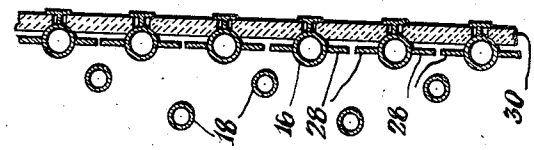
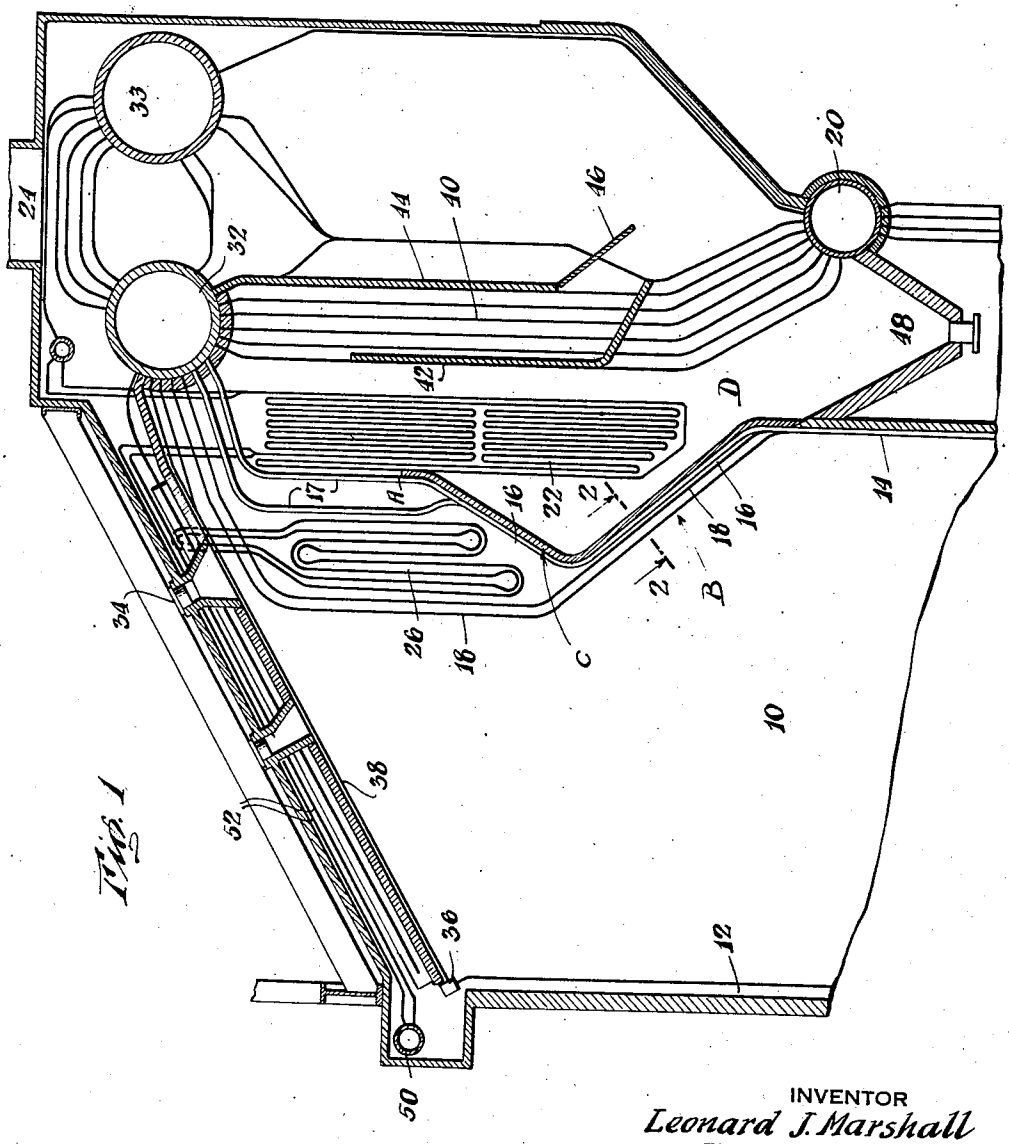


Fig. 1



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ASH DEFLECTING BAFFLE

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6 Claims. (Cl. 122—336)

This invention relates to steam generators and particularly to an improved baffle arrangement for high capacity steam generating units using pulverized coal as a fuel.

In such boilers the superheater is so located as to be contacted by intensely hot gases from the furnace in order to obtain the very high superheated steam temperatures required. Consequently, the superheater is exposed, at least in part, to gas temperatures so high that some of the ash particles may be in a plastic state and adhere to its tube surfaces.

According to the invention one section of the superheater is mounted in such an exposed position within the upper portion of the furnace and shielded from the furnace by furnace wall tubes arranged in open formation across the furnace outlet. The upper part of a water cooled partition or baffle extends beneath the superheater, the partition sloping downwardly toward the furnace so as to discharge into the furnace any slag that falls from the superheater. A second superheater section is located on the other side of this partition and closer to the boiler offtake so that it is subject to gases of lower temperature at which substantially all ash particles are no longer in a state at which they may adhere to the superheater tubes. The lower part of the baffle extends beneath the second superheater section and slopes in the opposite direction to its upper part which is located beneath the first superheater section. The lower part of the baffle may also form a side of a hopper for the ash particles falling from the second superheater section.

The invention will be best understood by reference to the accompanying drawing in which:

Figure 1 is a vertical sectional view of a high capacity steam generating boiler embodying the invention; and

Figure 2 is a sectional view through the rear furnace wall on line 2—2 in Figure 1.

The furnace 10 is fired by pulverized fuel burners and has water tubes 12 extending for the full height of the front wall. On the rear furnace wall 14 the water tubes 16, 18 are vertical to a point slightly above the water drum 20. Beyond this point the tubes are inclined first inwardly across the furnace toward the front wall and beneath the section 22 of the superheater. The alternate tubes 16 are then inclined reversely or toward the offtake 24 and beneath the section 26 of the superheater, which section is nearest the furnace outlet and screened by the other tubes 18 of the rear wall section that extend vertically across the furnace outlet. The tubes 16 are provided with fins 28 to form a substantially closed metallic wall and carry refractory blocks 30 to a point A somewhat below the steam drum 32 thereby forming a baffle B, C. As mentioned above the lower part B of this baffle is inclined forwardly into the furnace while the upper part C is inclined rearwardly to the point A bounding the lower side of the offtake passage of the furnace. Beyond the point A the fins 28 are omitted from the tubes and they spread into an open formation so as to allow the gases to pass therebetween on their way from the furnace. The portion B of the baffle extends inwardly to a point below superheater section 26 so as to deflect the gas flow forward of said superheater section and to protect the bottom thereof from the intense heat of the furnace. The slope of this portion of the baffle is such that it serves as a deflector beneath superheater section 22 down which any ash particles which may be blown off superheater section 22 will gravitate. The portion C of the baffle beneath superheater section 26 is sloped so that any slag blown off this superheater section will slide down the baffle into the furnace. The superheater section 26 is exposed to gas temperatures at which some of the ash particles may be in a plastic state and adhere to its tube surfaces. The superheater section 26 preferably has a tube spacing and disposition that reduces the tendency of the ash to slag thereon and readily permits the removal of any adhered ash therefrom. Steam is removed from the front wall tubes 12 through header 36 and by risers 38 which serve as roof tubes for the furnace and connect into the steam and water drum 32 of the boiler. Lance holes 34 are provided through which lances may be inserted in order to blow slag and ash off the superheater sections. The arrangement and spacing of the roof tubes 38, superheater tubes 26 and the screen tubes 18 and 17 are such that clear lanes exist through which lances entering through openings 34 may pass unobstructedly for lancing the superheater section 22.

Drums 20 and 32 are connected by a bank of tubes 40. The tubes extend vertically downward from drum 32 for the major portion of their length and then bend rearwardly to drum 20 thereby allowing a free and unobstructed passage D through which the ash blown off superheater section 22 may fall into a hopper 48. The lower ends of tubes 40 thus remain free of fouling by said ash. The vertical portions of the outer rows of tubes 40 in the bank carry baffles 42 and 44 so arranged that a portion of the gases flowing across the top of superheater section 22 may be

by-passed downwardly over the tubes **40** and out through an opening provided with a damper **46** for controlling the amount of by-passed gases. By regulating the amount of by-passed gases the degree of superheat may be controlled. The baffles **42, 44** are so arranged that the amount of cooling of the gases in the by-pass is substantially the same as the amount of cooling of those gases which pass over the superheater section **22** and the lower portion of tubes **40**.

The superheater is supplied with steam from drum **33** first to section **22** and then to section **26**. From section **26** the superheated steam is led to offtake header **50** via connections **52** which extend above the roof of the furnace. These long extensions of the superheater tubes provide flexibility in all directions between superheater section **26** and the header **50** so that provision for movement of header **50** with respect to a closely adjacent point of use, such as a turbine, becomes unnecessary.

What I claim is:

1. In a boiler having upper and lower drums, a furnace located at one side of said drums and a gas passage leading from the furnace outlet between said drums to the offtake; at least two groups of heat absorbing elements located in said passage and spaced in the direction of gas flow; an ash hopper located outside the furnace beneath the group of heat absorbing tubes remote from the furnace outlet; a roof for said furnace inclined downwardly from adjacent the upper drum to the upper end of the outer furnace wall opposite said drums and provided with openings therethrough for introducing tools to clean said heat absorbing elements; baffle means having its upper end located between two groups of heat absorbing elements at one side of said upper drum in spaced relation below the latter and having a portion inclined downwardly and outwardly beneath a group of elements adjacent the furnace outlet to discharge ash from said elements into the furnace and a contiguous portion inclined reversely beneath the second group of elements to discharge ash therefrom into said hopper.

2. A steam generator having a furnace fired with finely divided solid fuel producing a slagging ash; a set of superheater tubes positioned over the furnace closely adjacent its outlet and subjected to gas temperatures at whch said ash adheres to said tubes; a second set of superheater tubes positioned beyond said first set in the direction of gas flow and subjected to gas temperatures at which ash does not adhere to said tubes; an ash hopper located outside of the furnace below said second set of superheater tubes; a rear fluid cooled wall for said furnace comprising closely spaced wall tubes having the upper portion of some of the tubes first inclined forwardly toward the furnace beneath said second set of superheater tubes and then inclined rearwardly away from the furnace beneath said first set of superheater tubes; means on the inclined portions of said tubes forming deffecting baffles positioned beneath said sets of superheater tubes, the inclination of said baffles being such that ash particles falling from the first set of superheater tubes are discharged into the furnace and those falling from the second set of superheater tubes are discharbed into said hopper.

3. A baffle construction as recited in claim 2 wherein alternate tubes in said furnace wall form said inclined deflecting baffles and the remaining tubes extend upwardly in spaced relation in front of said first set of superheater tubes between the latter and the furnace.

4. A baffle construction as recited in claim 2 wherein alternate tubes in said furnace wall form said inclined deflecting baffles and extend thereabove in spaced relation between said superheater sections and the remaining tubes extend upwardly in spaced relation in front of said first set of superheater tubes between the latter and the furnace.

5. In a steam generator having a furnace wherein a slag forming fuel is burned; a furnace wall lined with water cooled tubes; means connecting said tubes into the circulation of the steam generator; means forming a furnace outlet gas pass above said wall; means forming a second downflow gas pass beyond said outlet with respect to the gas flow from the furnace; a superheater in two sections subject to the gas flow from said furnace, one section being located in said outlet pass and the other in said second pass, at least some of said wall tubes extending upwardly and inclined first toward the furnace below said superheater section in said second pass and then inclined away from the furnace below the superheater section in said outlet pass; baffle means associated with said wall tube extensions to form the bottoms of the respective gas passes; and means at the bottom of the second pass for receiving ash.

6. A steam generator having a furnace fired with finely divided solid fuel producing a slagging ash; a set of superheater tubes arranged in rows spaced transversely of the direction of gas flow and positioned over the furnace closely adjacent its outlet, said tubes being subjected to gas temperatures at which said ash adheres to said tubes; a second set of superheater tubes positioned beyond said first set in the direction of gas flow and subjected to gas temperatures at which ash does not adhere to said tubes; an ash hopper located outside of the furnace below said second set of superheater tubes; a fluid cooled rear wall for said furnace comprising closely spaced wall tubes having the upper portion of some of the tubes first inclined forwardly toward the furnace beneath said second set of superheater tubes and then inclined rearwardly away from the furnace beneath said first set of superheater tubes; means on the inclined portions of said tubes forming deflecting baffles positioned beneath said sets of superheater tubes, the inclination of said baffles being such that ash particles falling from the first set of superheater tubes are discharged into the furnace and those falling from the second set of superheater tubes are discharged into said hopper, alternate tubes in said furnace wall forming said inclined deflecting baffles and the remaining tubes extending upwardly in spaced relation in front of said first set of superheater tubes between the latter and the furnace and are in horizontal alignment in the direction of gas flow with the rows of said first set of superheater tubes; and lance doors arranged in a furnace wall in horizontal alignment with the lanes between said rows of tubes.

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