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J. VAN BRUNT ET AL

2,242,491

SLAGGING FURNACE

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Fig. 1.

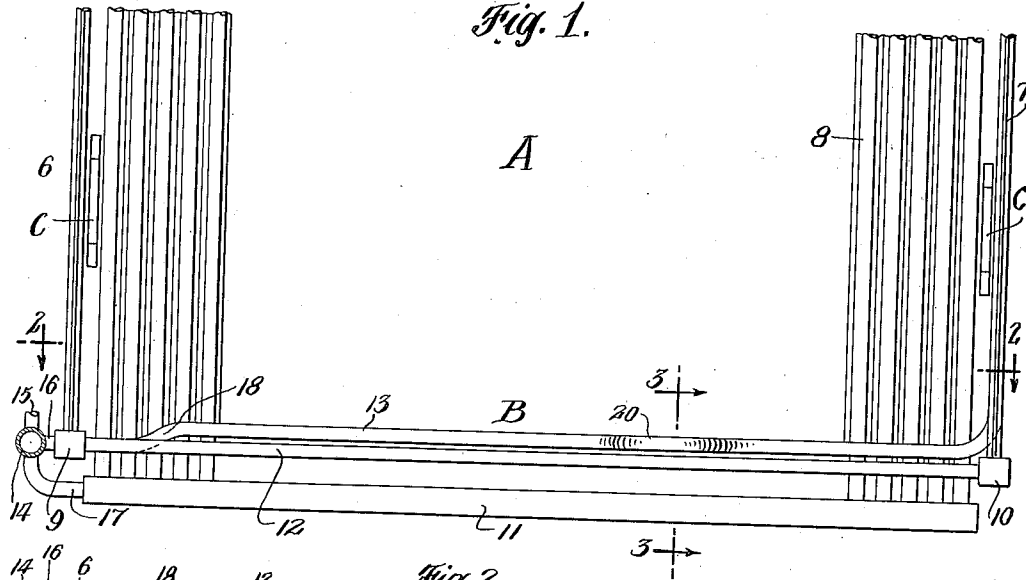


Fig. 2. B

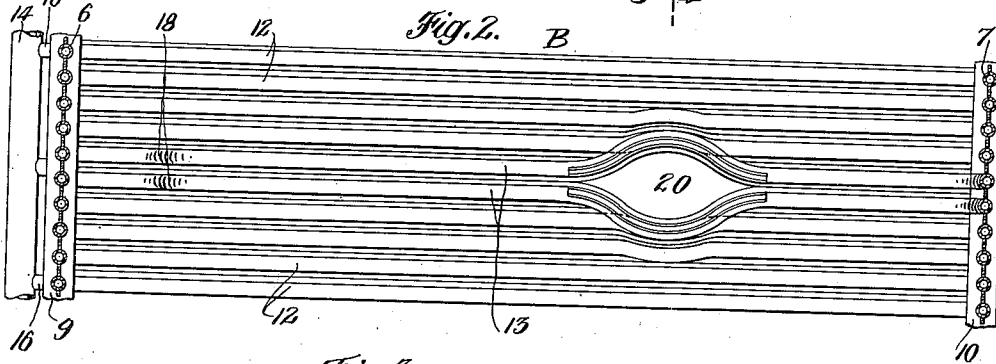


Fig. 3

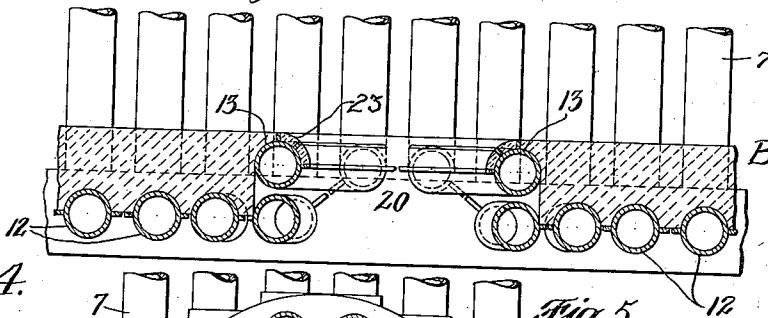


Fig. 4.

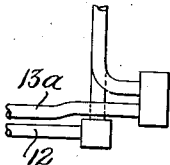
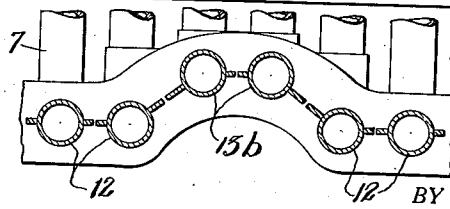


Fig. 5



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SLAGGING FURNACE

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Application June 5, 1939, Serial No. 277,380

6 Claims. (Cl. 122-235)

This invention relates to improvements in bottom constructions of slagging furnaces and particularly to bottoms of tubular construction in which liquid slag discharges through an opening in the bottom.

One of the primary objects of our invention is the provision of improvements in the construction and arrangement of the cooling tubes of such bottoms.

More specifically, it is one of the objects of our invention to provide an improved arrangement of the tubes of such tubular bottoms which form the boundary of the slag discharge opening.

Another object of our invention is to provide an arrangement of the tubes of the bottom by means of which any desired level of the slag bed may be obtained in a very simple manner.

Other objects have to do with the manner of connecting the bottom tubes into the circulation of the boiler which is associated with the furnace.

How the foregoing, together with such other objects and advantages as may hereinafter appear, or are incident to our invention, are realized, is illustrated in preferred form in the accompanying drawing, wherein—

Figure 1 is a fragmentary sectional elevational view of the lower portion of a slagging furnace embodying our invention;

Figure 2 is a fragmentary plan view taken on the line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary cross-sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a fragmentary view of a modification of the invention; and

Figure 5 is an enlarged cross-sectional view illustrating another modification of the invention.

In the drawing we have illustrated the lower portion of a combustion chamber A of a boiler and furnace installation, the bottom B of which is constructed in accordance with our invention. The front, rear and side walls are provided with upright steam evaporating tubes 6, 7 and 8, respectively, and burner means C for the introduction of fuel, such as pulverized coal, are provided, these being located in this case at the corners of the combustion chamber for vortical firing.

The front, rear and side wall tubes 6, 7 and 8 are connected at their lower ends into bottom headers 9, 10 and 11, respectively, and at their upper ends for delivery into steam space of the boiler.

The bottom B comprises a plurality of closely spaced water tubes 12 connected at one end into

the header 9 and at the other end into the header 10, and a plurality of tubes 13, in this instance two, which are connected at one end into the header 9 and, as shown in Figures 1 and 2, are bent upwardly at their other ends to extend along the rear wall with the tubes 7.

A header 14 having a downcomer connection 15 with water space of the boiler is provided to supply water to the furnace tubes, there being connections 16 from this header to the header 9 and connection 17 to the side wall headers 11, it being pointed out that a header 11 and side wall tubes 8 similar to those shown in Figure 1 are employed at the rear side wall as well as at the far side wall shown.

The bottom tubes 13 referred to are bent upwardly at 18 so that they lie in a plane somewhat above the plane of the remaining bottom tubes 12, and they are bowed at 19 to form a liquid slag discharge opening 20 extending through the bottom. The bowed portions of these tubes define the periphery of the opening 20 so that a cooled lip is provided over which the discharging liquid slag flows. As illustrated in Figure 2, certain of the tubes 12 are also bowed in the region of this opening.

The bottom tubes are provided with longitudinally extending substantially abutting fins 21 for closing the spaces therebetween. It is to be noted that the fins 22 of the tubes 13 and of the adjacent tubes of the set of tubes 12 are disposed at an angle, as clearly shown in Figure 3, because of the elevation of the tubes 13 above the level of the tubes 12. The tubes 13 are also provided with longitudinally extending radially disposed fins for retaining refractory material 23 at the lip of the opening.

The bottom tubes are provided with a lining or covering 24 of refractory material and, as shown in Figure 3, this covering is of a thickness such that its top surface is flush with the refractory material 23 at the lip of the opening. It is to be understood, however, that this covering may be made of less thickness so that a bed of liquid slag may be maintained on the bottom, if desired.

The particular arrangement of raising the tubes forming the boundary of the slag opening is advantageous in that the level of liquid slag in the furnaces is thereby raised above the top of the headers 9 and 10 into which the bottom tubes are connected. Through this novel arrangement a level of the bed of liquid slag at any desired level may be obtained by merely

altering the amount that the tubes 13 are raised above the level of the tubes 12.

In the modification illustrated in Figure 4 we have shown the cooling tubes 13a, which correspond to the tubes 13 above described, connected into an outside header 25 from which upcomer tubes 26 lead to steam space of the boiler.

In Figure 5 we have shown a modification in which the end header 10a, which corresponds to the header 10 above described as having a bent or upwardly curved portion 27 into which the raised cooling tubes 13b for the slag opening are connected. All of the upright steam evaporating tubes 7 of the rear wall are connected into this header 10a.

We claim:

1. In a bottom for slagging furnaces having a liquid slag discharge opening extending therethrough, the combination of cooling tubes extending across said bottom in closely spaced relation and lying in a horizontal plane, end headers into which the ends of said cooling tubes are connected, a pair of similarly extending tubes the major portions of which lie in a horizontal plane spaced above the plane of said first mentioned tubes and headers, said pair of tubes being bowed to provide a peripherally cooled lip for said liquid slag discharge opening; fins on said first mentioned tubes substantially closing the spaces therebetween and angularly disposed fins on said pair of tubes and the tubes adjacent thereto for substantially closing the spaces therebetween, and refractory covering for said tubes for preventing liquid slag from passing through said bottom except at said opening.

2. In a furnace for burning slag forming fuel, the combination of a combustion chamber, and a bottom for said chamber having a liquid slag discharge opening extending therethrough comprising spaced water tubes extending across said bottom in closely spaced relation and lying in a horizontal plane, a pair of similarly extending tubes the major portions of which lie in a plane above the plane of said first mentioned tubes, said pair of tubes being bowed to provide a peripherally cooled lip for said slag discharge opening, upright steam evaporating tubes at a wall of said combustion chamber, and a water compartment into which one end of said pair of tubes are connected to receive water, the other end of said pair of tubes being connected to said upright steam evaporating tubes.

3. In a furnace for burning slag forming fuel, the combination of a combustion chamber and a bottom for said chamber having a liquid slag discharge opening extending therethrough, com-

prising spaced water tubes extending across said bottom in closely spaced relation, certain of said tubes being raised above the level of the remaining tubes and having bowed portions providing a cooled lip for said liquid slag discharge opening, said certain tubes having upwardly bent portions extending along a wall of said combustion chamber to constitute steam evaporating tubes thereat.

4. In a furnace for burning slag forming fuel, the combination of a combustion chamber and a bottom for said chamber having a liquid slag discharge opening extending therethrough, comprising spaced water tubes extending across said bottom in closely spaced relation, certain of said tubes being raised above the level of the remaining tubes and having bowed portions providing a cooled lip for said liquid slag discharge opening, a downcomer header into which said bottom tubes are connected at one end, and a header into which the other ends of said tubes are connected, said last mentioned header having an up-raised portion into which said raised tubes are connected.

5. In a bottom for slagging furnaces having a liquid slag discharge opening extending therethrough, the combination of substantially horizontally disposed cooling tubes extending across said bottom in closely spaced relation, means closing the spaces between said tubes, end headers into which the ends of said tubes are connected, a pair of similarly extending tubes, the major portions of which lie in a substantially horizontal plane above the plane of said first mentioned tubes and headers, said pair of tubes being bowed to provide a peripherally cooled lip for said liquid slag discharge opening, and means closing the spaces between said pair of tubes and the adjacent tubes of said first mentioned tubes.

6. In a bottom for slagging furnaces having a liquid slag discharge opening extending therethrough, the combination of substantially horizontally disposed cooling tubes extending across said bottom in closely spaced relation, end headers into which the ends of said tubes are connected, a pair of similarly extending tubes, the major portions of which lie in a substantially horizontal plane above the plane of said first mentioned tubes and headers, said pair of tubes being bowed to provide a peripherally cooled lip for said liquid slag discharge opening, and refractory covering for said tubes for preventing liquid slag from passing through said bottom except at said opening.

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