June 23, 1931. W. R. WOOD 1,811,657

FURNACE FOR BURNING PULVERIZED FUEL

Original Filed June 16, 1925

Fig: 1.

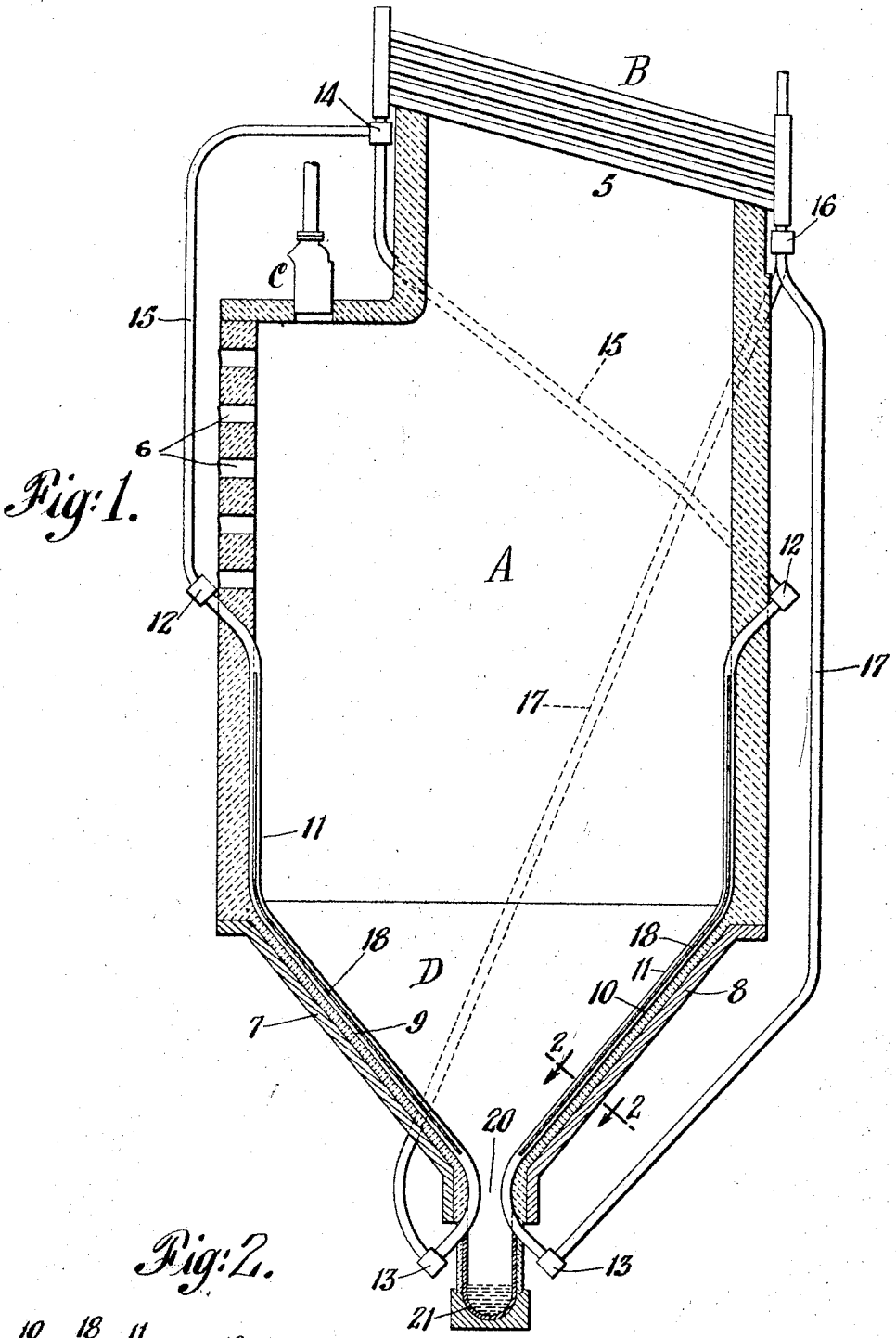
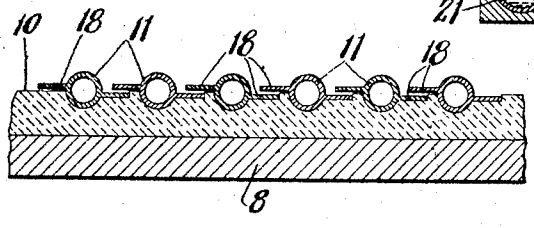


Fig: 2.



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FURNACE FOR BURNING PULVERIZED FUEL

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This invention relates to improvements in furnaces for burning finely divided fuel in suspension particularly as regards the manner of disposing of ash and refuse.

In the burning of pulverized fuel difficulties are encountered because of the ash and refuse becoming fused due to high temperatures, which results in slag formations of an objectional nature, not to be easily removed.

Spaced cooling tubes across the furnace below the zone of combustion have been provided heretofore for lowering the temperature of the ash particles with the results that the above difficulties have been greatly obviated.

I aim to provide an improved arrangement of cooling means for overcoming slagging and fusing difficulties in a simple, inexpensive and effective manner.

More specifically stated, it is an object of this invention to provide the combustion chamber of the furnace with a hopper shaped bottom, having surfaces provided with tubes thru which a heat absorbing medium is circulated, whereby the temperature of the ash is lowered below fusion temperature.

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

Fig. 1 is a vertical longitudinal section thru a pulverized fuel burning furnace for carrying out my invention; and

Fig. 2 is a section taken on the line 2—2 of Fig. 1.

Referring now more particularly to Fig. 1 the combustion chamber is indicated by the reference letter A, the lower portion of any suitable type of boiler by the reference letter B, the burner or fuel delivery means at C, and the ash pit at the bottom of the combustion chamber at D.

In the present instance fuel and air are introduced thru the burner or burners C in a downward direction, and takes a U-bend in the zone of combustion and passes out thru the outlet 5, under control of the draft. The hot gases and products of combustion in passing thru the outlet 5 generate steam in the boiler B, tubes of which extend across the outlet opening. Auxiliary damper controlled inlets 6 are provided at various points in the front wall of the furnace.

The bottom of the furnace or ash pit is of hopper shape, the inclination of the sides 7 and 8 thereof being greater than the angle of repose of the refuse or ash, so that such particles will gravitate to the bottom of the pit as will hereinafter more fully appear.

The inner surfaces 9 and 10 of the ash pit D, and the lower portions of the front and rear upright walls are provided with cooling means extending thereover, such means in this instance being shown as a plurality of closely spaced tubes 11 thru which cooling fluid, preferably water is caused to flow, such tubes being connected into the circulation of the boiler. The tubes 11 terminate at the upper ends in headers 12 and at the lower ends in headers 13. The upper headers 12 are connected to the header 14 of the boiler by upcomer tubes 15 and the lower headers 13 are connected to the header 16 of the boiler by downcomer tubes 17, the circulation hence being readily understood. These tubes extend from the lower part of the ash hopper or pit D upwardly for some distance adjacent the inside surfaces of the combustion chamber A, thus providing cooled wall surfaces as well as cooled ash pit surfaces, making it possible to decrease the size of the combustion chamber and/or the boiler proper, besides protecting the upright walls.

I have shown the tubes 11 provided with overlapping fins 18, (see Fig. 2), so that a more or less continuous cooling surface is provided. It is to be understood, however, that this continuous surface may be formed in other ways, as for example, by providing grooved metallic blocks closely fitting the tubes 11 so as to conduct heat received by radiation to all parts of the tubes.

It will be seen from the foregoing that the ash and refuse which gravitate during the burning of the fuel will lodge on the cooling surfaces and such surfaces being cool, particles will be cooled and take a granular-like form, with the result that, be-

cause of the angle of inclination, they will gravitate.

The arrangement is particularly useful where vertical firing is employed because this form of firing has a tendency to throw down refuse particles. In addition the cooling surfaces, because they are subject to radiant heat, evaporate such large quantities of water as to make it possible to materially cut down the size of the boiler proper, and to greatly increase the capacity of an existing boiler if added thereto. The arrangement is also one which reduces the amount of dead space required in the combustion chamber as the flames may be brought further down than heretofore possible. This means that a smaller combustion chamber can be utilized, or stated in another way, that more fuel can be burned in a combustion chamber of given size.

The opening 20 at the bottom of the ash pit D may be of such dimension as to allow free passage of the particles of ash and small clinker. Any suitable form of discharge openings at the lowest part of the incline, however, may be provided.

I have shown a trough 21 of necessary extent below the opening 20 preferably containing water for receiving the refuse from whence it may be removed in any suitable manner, such trough also serving to prevent passage of air in through the opening 20.

In some instances, it may be desirable to to have the tubes 11 constitute superheater tubes, or part superheater tubes and part water circulation tubes connected into the boiler circulation. When superheater tubes are used, such tubes are connected to the steam space of the boiler.

Certain of the advantages herein pointed out are effectively realized by virtue of the fact that very rapid circulation is obtained thru the cooling tubes.

I claim:

1. In a furnace for burning finely divided fuel in suspension, a boiler, a combustion chamber having substantially upright walls and a sloping bottom portion therebelow, a plurality of closely spaced tubes lining the sloping bottom portion and extending up within the combustion chamber adjacent an upright wall thereof, each of the said tubes lying in a substantially upright plane and having within the furnace and bottom thereof fin members at opposite sides, the fins on one tube being in substantial juxtaposition to the fins on adjacent tubes to form a continuous metallic surface, the said tubes being bent at their upper ends to extend out through a wall of the combustion chamber, and means connecting said tubes into the circulation of the boiler.

2. In a furnace for burning finely divided fuel in suspension, a boiler, a combustion chamber having substantially upright walls and a sloping bottom portion therebelow, a plurality of closely spaced exposed tubes lining the sloping bottom portion and extending up within the combustion chamber adjacent an upright wall thereof, each of the said tubes lying in a substantially upright plane and having fin members at the opposite sides thereof, the fins on one tube overlapping the fins of the adjacent tubes, the upper ends of said tubes extending through a wall of the combustion chamber, and means connecting the said tubes into the circulation of the boiler.

3. In a furnace for burning finely divided fuel in suspension, a boiler, a combustion chamber having upright walls and a sloping bottom for discharge of refuse, a plurality of closely spaced exposed tubes lining the bottom and disposed at an angle greater than the angle of repose of refuse particles and exposed water-tube-wall portions lining at least a substantial part of upright walls adjacent the bottom of the chamber and connected for circulation whereby heat is absorbed in substantial quantities above the said bottom.

4. In a furnace for burning finely divided fuel in suspension, a boiler, a combustion chamber having upright walls and a sloping bottom for discharge of refuse, a plurality of closely spaced exposed tubes lining the bottom and disposed at an angle greater than the angle of repose of refuse particles and exposed water-tube-wall portions lining at least a substantial part of upright walls adjacent the bottom of the chamber and connected for circulation whereby heat is absorbed in substantial quantities above the said bottom, the said tubes and the water tube wall portions being in series connection.

5. In a furnace for burning finely divided fuel in suspension, a boiler, a combustion chamber having upright walls and a hopper shaped bottom having a centrally disposed discharge orifice, two sets of closely spaced exposed tubes lining the sloping sides of the bottom and disposed at angles greater than the angle of repose of the refuse particles, and two exposed water tube-wall portions lining two opposite upright wall portions adjacent the bottom of the chamber and connected in series with said tubes, the tubes and the water tube wall portions being connected into the circulation of the boiler.

In testimony whereof, I have hereunto signed my name.

W. R. WOOD.