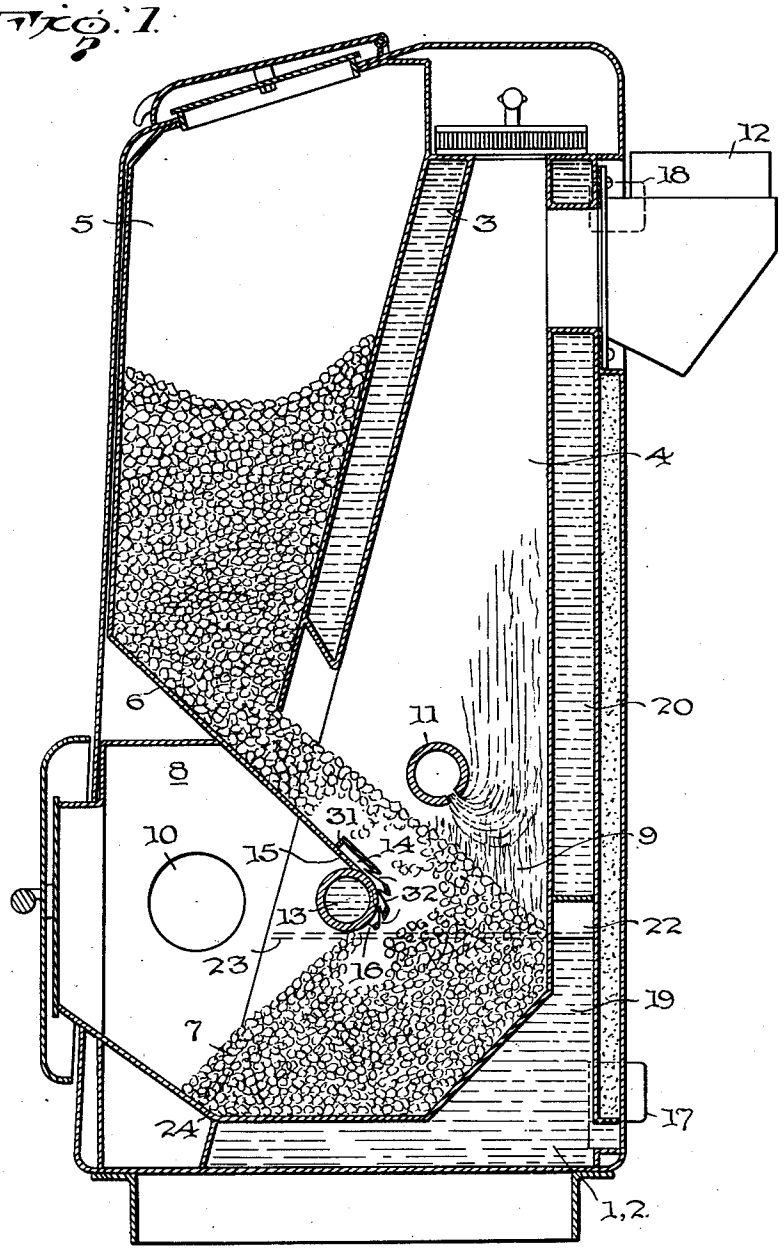
Dec. 19, 1950 L. SATCHWELL ET AL 2,534,377

BOILER FURNACE

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FIG. 1.



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Fig. 2.

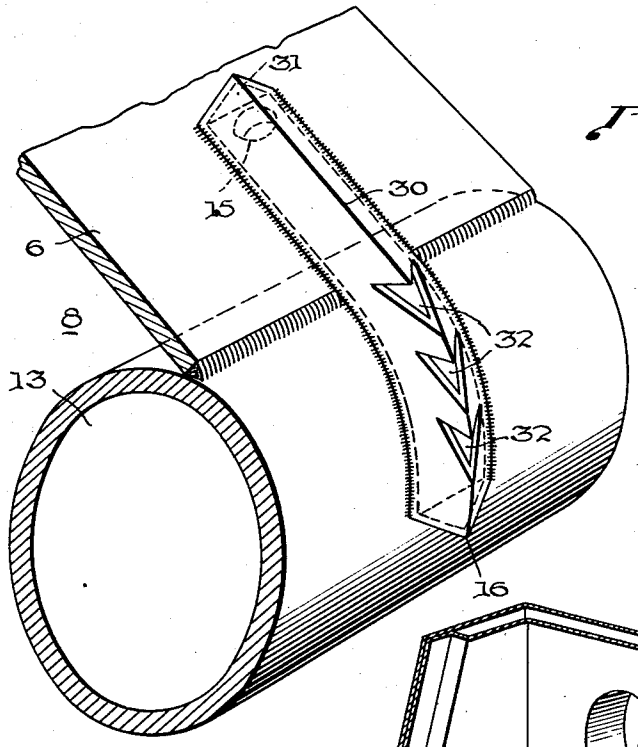
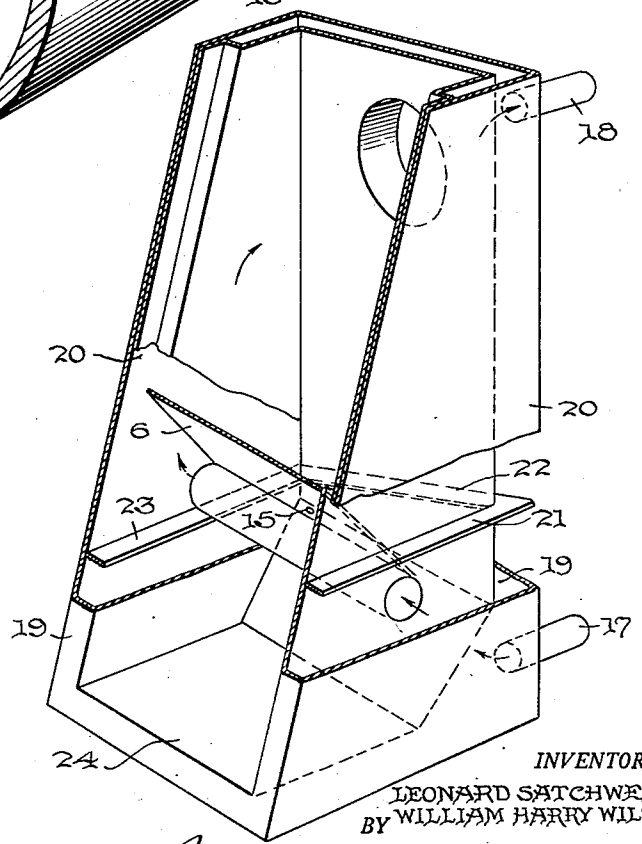


Fig. 3.



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BOILER FURNACE

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1 Claim. (Cl. 122—30)

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This invention relates to boilers for burning solid fuel under natural draught conditions of the kind provided with a fuel storage hopper or magazine from which the fuel gravitates to the lower part of the boiler where combustion takes place, the gravitation of the fuel being regulated by the rate of combustion of said fuel, the combustion rate in turn being governed by the heat demand through the action of a thermostatically controlled air inlet damper.

More particularly the invention relates to improvements in grateless boilers in which fuel gravitates from a hopper down a fuel slope to form a pile standing on the water wayed floor of the boiler one sloping side of the fuel pile forming the bottom boundary of the secondary combustion space and the opposite sloping side facing the primary air space and bounded at its upper end by the end of the fuel slope from the hopper thus giving a fuel bed of constant depth.

It has been proposed to form the fuel slope from the hopper as a water wayed tongue protruding inwards from one water wayed wall of the boiler its upper surface forming the slope and its under surface bounding the top of the fuel pile and forming the top of the primary air space.

Such tongue was water wayed with the object of allowing free water circulation to take place in it to avoid any settlement of sludge which would impede circulation and by raising the temperature gradient between the fire and water surfaces give rise to burning of the metal of the tongue. This was particularly important as the highest combustion rate occurs in the fuel bed immediately adjacent the lower end of the fuel slope.

In thermostatically controlled furnaces in which the fuel is burned in a pile on an imperforate floor it has been found that danger of explosion exists due to the release of volatiles at times when the conditions for ignition are unfavourable and it has further been found that if provision is made for continuous ignition of said volatiles explosion is avoided, an accumulation of unburnt volatiles being so avoided. If air is admitted at a point immediately above a position of continuous incandescence the condition for uninterrupted combustion of volatiles is provided.

The present invention purposes to provide a simple and convenient form of fuel slope with such a minimum of water-way that the necessary air supply for combustion of volatiles can readily be provided. The construction of a fully water wayed tongue is moveover difficult and expensive and in this invention the fuel slope from the

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hopper consists of a single plate member terminating in a water tube across the boiler.

It is then provided that air can be taken from the primary air space of the furnace through a hole in the single plate fuel slope and conducted to the water wayed tip of the fuel slope by a channel welded to the fuel slope and water tube which channel terminates in an outlet or outlets positioned at or above the point of maximum incandescence in the fuel bed.

The invention also includes the provision of means whereby this simplification of fuel slope and waterway may be made safe by efficient water circulation against accumulation of deposit. For this purpose it is provided that baffles be positioned in the side and back waterways of the boiler so that all the water flow between the inlet and outlet pipes of the boiler is made to traverse this tubular waterway thus ensuring a water speed through the tube greater than in any other part of the boiler and effectively preventing any accumulation of sludge therein.

In the accompanying drawings Fig. 1 shows a vertical section through a boiler of this type, Fig. 2 is a view partly in section showing the arrangement for the provision of an air bleed into the fuel bed, and Fig. 3 is a perspective view partly in section of the water bearing shell of the boiler with the front waterway omitted.

In the drawings and referring to Fig. 1, 1, 2 is a water way forming the floor and back of the combustion chamber and 3 is a front water way separating the secondary combustion space 4 from the hopper space 5. These water ways are made common by their connection to side water ways by suitable means, e. g. welding, shown more clearly in Fig. 3 from which water way 3 Fig. 1 has been removed for clarity. Fuel from hopper 5 gravitates down the fuel slope plate 6 to form a pile resting on the water wayed floor of the boiler which pile has two free faces one at 7 facing the primary air supply space 8 and the second 9 forming the bottom of the secondary combustion space 4. Air enters primary air space 8 through one or more openings as indicated at 10 and passes through the fuel bed entering through face 7 and leaving face 9. The channel 14 receives air through the hole 15 in fuel slope plate 6 conducts it to a delivery point 16 within the bed of fuel. A supplementary air supply is introduced at 11 to provide oxygen for secondary combustion which completes the combustion of the gases leaving the fuel bed at 9. A tubular waterway 13 is positioned at the lower end of the plate 6 and spaced from the rear

furnace wall. The space between the waterway 13 and the rear wall is normally filled with fuel forming the fuel bed. Connection to a chimney is made at 12.

Fig. 2 is a detailed view of the means provided to conduct air from the primary air space to a point inside the fuel bed; in which to the lower end of plate 6 and to the tubular water way 13 is welded a channel member 30, shown as of triangular section shaped to follow the curvature of the tube 13. The channel member 30 is closed at its upper end 31 and open at its bottom end and is formed intermediate its ends with slots or cuts 32 so formed that overhanging portions shield the slots from falling fuel. The open bottom end 16 ensures that any small pieces of fuel entering the tube are discharged from the bottom. A hole 15 through the plate 6 provides an air supply into the channel member 30 from the primary air chest 8. The air thus supplied to the slots 32 is released into the fuel bed through the slots at a position immediately above the zone of maximum incandescence in the fuel.

In Fig. 3 some of the walls of the water ways are broken away to show the disposition of the baffles. Water circulating in a heating system enters the boiler at return pipe 17 and leaves from flow pipe 18. The water wayed walls are separated into water spaces 19 and 20 by baffles 21, 22, 23 positioned across the water space. 13 is the tubular water way welded to the end of the fuel directing wall 6 which forms the fuel directing slope from the hopper (not shown) to the combustion zone between the tube 13 and the inside floor 24 of the boiler. The baffle 21 is located above the connection of the tubular water way 13 to one side wall and baffle 23 is

located below the connection of the tubular water way 13 to the opposite side wall while baffle 22 in the rear wall joins the ends of baffles 21 and 23. As a result of this arrangement, all the circulating water is forced to traverse the tube 13 in passing through the boiler from return pipe 17 to flow pipe 18, thus preventing any settlement of sludge therein.

We claim:

In a natural draft solid-fuel-fired furnace of the hopper type, an inclined plate, a tubular waterway at the lower end of said inclined plate and spaced from one of the furnace walls to provide a space for a fuel bed, said inclined plate being adapted to direct fuel into said space, a chamber below said inclined plate and open to the atmosphere, said plate having a hole therein, and a conduit extending along the upper face of said plate and said waterway and covering and communicating with said hole, said conduit having openings adjacent said fuel-bed space, whereby air from said atmospheric chamber may pass through the hole in the plate, the conduit and the openings in the conduit into the fuel-bed space.

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