Aug. 2, 1960 J. A. TATEM ET AL 2,947,268

BOILERS

Filed Feb. 10, 1958 2 Sheets-Sheet 1

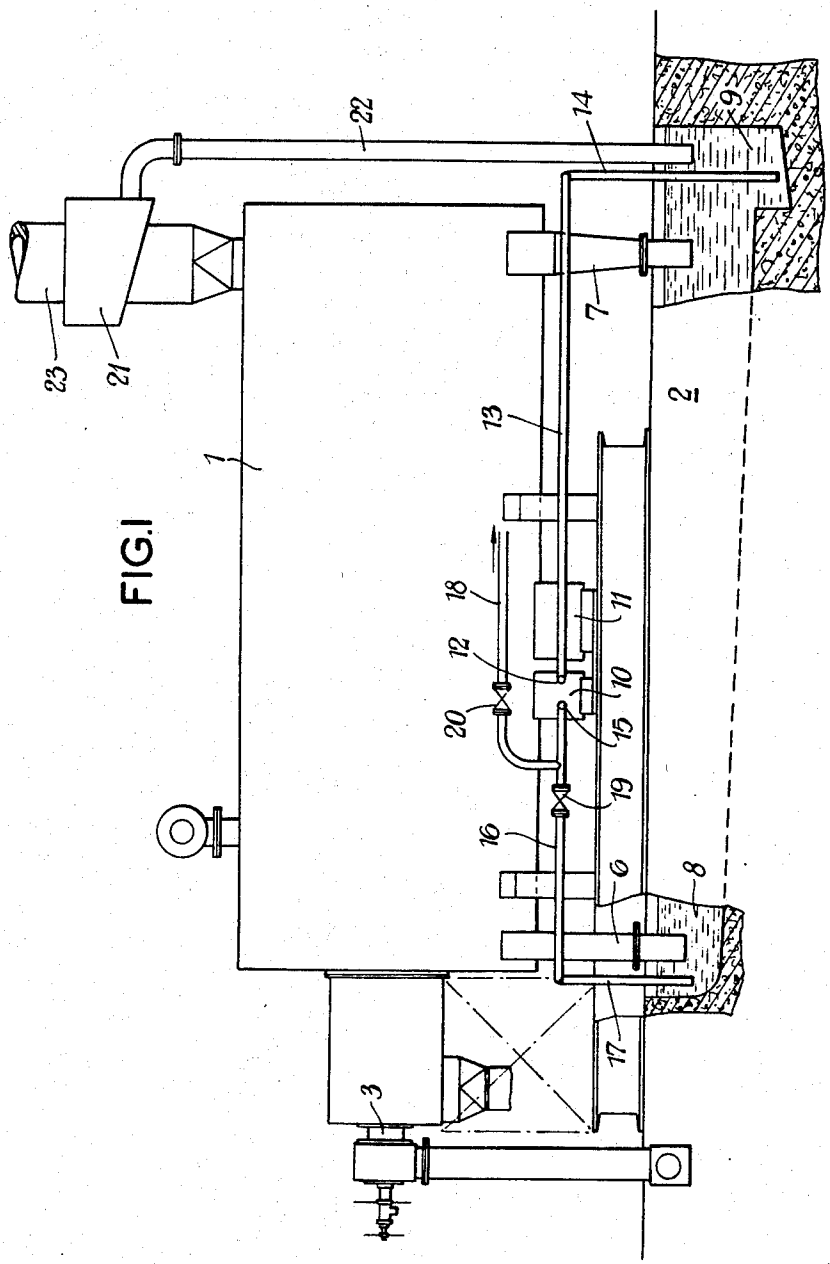


FIG.1

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2 Sheets-Sheet 2

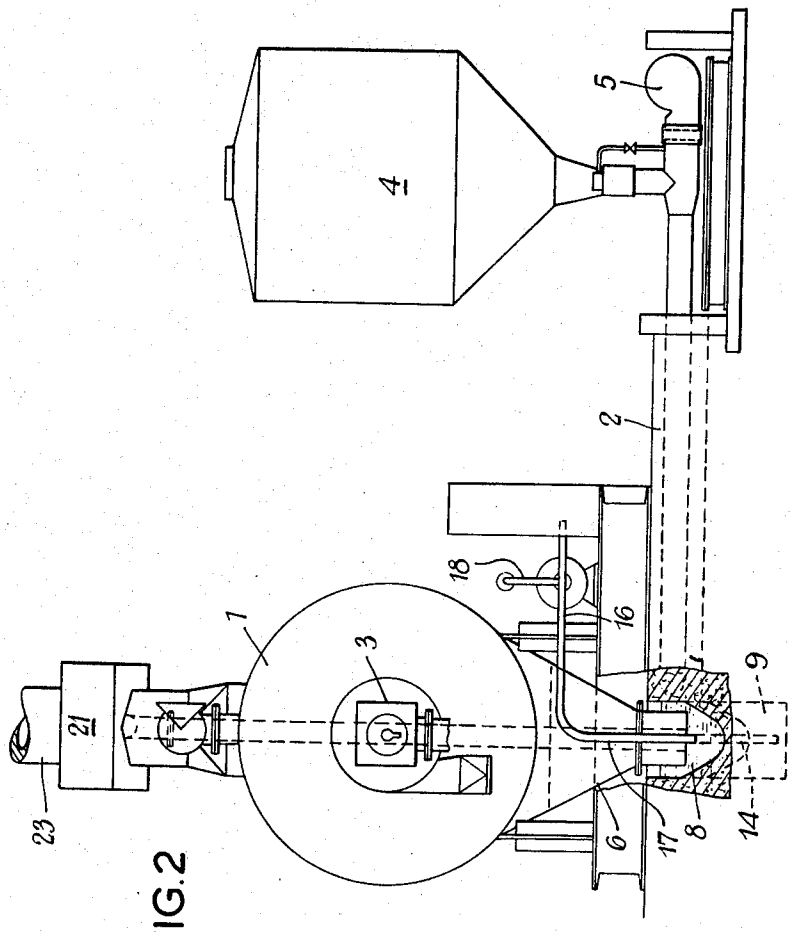


FIG. 2

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BOILERS

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2 Claims. (Cl. 110—165)

This invention relates to boilers and especially to boilers of the self contained type known as "packaged boilers."

An object of the present invention is to provide a packaged boiler which may be fired by pulverized fuel.

From one aspect, a boiler unit in accordance with the invention comprises a fire tube boiler fired by a pulverized fuel burner, means for separating fly ash from the combustion gases during their passage through the boiler unit and for depositing them in a water trough to form a sludge, means for circulating the sludge in a closed circuit and means for delivering a proportion of the sludge to a remote sump or the like.

From another aspect, in a boiler in accordance with the invention, fired with pulverized fuel the fly ash is abstracted from the combustion gases during their passage through the boiler and deposited into a water trough, the water in this trough being circulated with the deposited ash in a closed circuit from which a proportion of the water and ash is continuously extracted and delivered to a sump.

From yet another aspect, the invention provides a boiler unit comprising a pulverized fuel fired horizontal boiler, dust collecting means at each end of the boiler delivering fly ash into a water trough running longitudinally below the boiler, this trough sloping downwardly from one end to a sump at the other, and a sludge pump arranged to draw sludge from this sump and return a proportion of it to the other end of the trough and to deliver the remainder of it to a distant disposal point.

The water trough may be formed in the concrete or other foundation on which the boiler rests or may comprise a metal trough affixed to the bottom of the boiler unit and supplied therewith.

In some cases, it may be desirable to include a grit arrester in the boiler stack and this is then conveniently arranged to discharge into the water trough.

Other parts of the invention are embodied in the preferred form which will now be described in some detail by way of example with reference to the accompanying drawings in which

Fig. 1 is a side view of a boiler unit partly in cross-section and

Fig. 2 is an end view.

In this form, the boiler **1** is of the packaged type, that is it comprises a self contained steam generating unit which can be placed as a complete unit on prepared foundations **2** and requires only connection to feed water supply, and electricity supply to be ready for immediate use.

This boiler comprises a horizontal fire tube boiler of the type having one or more passes and having at each end reversal chambers for the reversal of the gases. It is provided with a pulverized fuel burner **3** which is fed with fuel from a hopper **4** (or direct from a pulverized) by means of a blower **5**.

The burner **3** produces hot gases which are directed into the fire tubes and which carry with them fly ash resulting from the combustion of the fuel. This fly ash is abstracted from the gases in the reversal chambers and is deposited into chutes **6**, **7** one at each end of the boiler **1**.

Beneath the boiler **1** is a water trough **8** running longitudinally from end to end of the boiler. This trough is of U-section or other section and slopes downwardly from the front to the rear of the boiler. At the low end there is provided a sump **9** formed by increasing the depth of the trough **8**.

The trough **8** may be formed in the concrete foundations **2** on which the unit **1** rests or it may be formed of metal and provided as part of the unit. In the later case, the concrete foundation may be suitably shaped to accommodate the trough.

On the boiler unit is provided a sludge pump **10** driven by an electric motor **11**. The inlet **12** of this pump is connected to a pipe **13** having an open-ended leg **14** directed downwardly into the sump **9**. The outlet **15** of the pump is connected to a pipe **16** having an open ended leg **17** directed downwardly into the other end of the trough **8**, forwardly of the chute **6** at the front end of the boiler. A branch pipe **18** also leads from the outlet of the sludge pump and this pipe **18** may be as long as necessary to reach to a suitable depositing point for sludge. Both the outlet pipes **16** and **18** are controlled by valves **19**, **20** so that the proportion of the pump output passing through either pipe may be controlled. Usually about 10% of the output is passed through the branch pipe **18** and the remaining 90% is returned to the trough **8**.

The sludge pump **10** draws sludge (comprising a mixture of water and fly ash) from the sump and delivers most of it to the front end of the trough **8** from where it flows down the trough to the sump **9**, thus setting up a closed circulation and washing any deposited fly ash into the sump. At the same time a proportion of the sludge is removed from the circulating system and deposited outside the system.

The arrangements is economical in its requirements for water for fly ash disposal since most of the water is used continuously. By removing a proportion of the sludge, the ash content of the circulating water is kept below a desirable limit, so long as the rate at which ash is removed through the branch pipe is at least equal to the rate at which ash is deposited in the trough. The ash density can be kept constant by electric or other automatic control.

Should some fly ash not be removed by the dust collectors in the boiler, a grit arrestor **21** may be fitted in the stack pipe **23** and the dust collected in this may be deposited through a down pipe **22** into the sump **9**.

It will be understood that the invention is not restricted to the details of the preferred form described by way of example which may be modified without departure from the broad ideas underlying them.

We claim:

1. In a packaged pulverized fuel-fired horizontal fire tube boiler, dust collecting means at each end of said boiler, means defining a water trough extending beneath said boiler substantially the full length thereof between said dust collecting means, the bottom of said trough being inclined and having a sump at its lower end, chutes leading from each of said dust collecting means to the adjacent end of said trough, a pump, first conduit means connecting the inlet of said pump directly to said sump, second conduit means connecting the outlet of said pump directly to the end of said trough remote from said sump to provide a closed recirculating circuit, first valve means in said second conduit means for controlling the flow therethrough, third conduit means connected to said second conduit means intermediate the outlet of the pump and said first valve means and leading to a disposal point remote from said boiler, and second valve means in said third conduit means to control the flow therethrough, said

first and second valve means cooperating to control the proportion of the output of said pump delivered to said disposal point and recirculated through said trough, respectively.

2. A boiler unit as claimed in claim 1 wherein said boiler is mounted on a concrete foundation and said trough is preformed in said foundation.

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