Aug. 22, 1933. T. E. MURRAY 1,923,875

BOILER

Original Filed Nov. 9, 1923

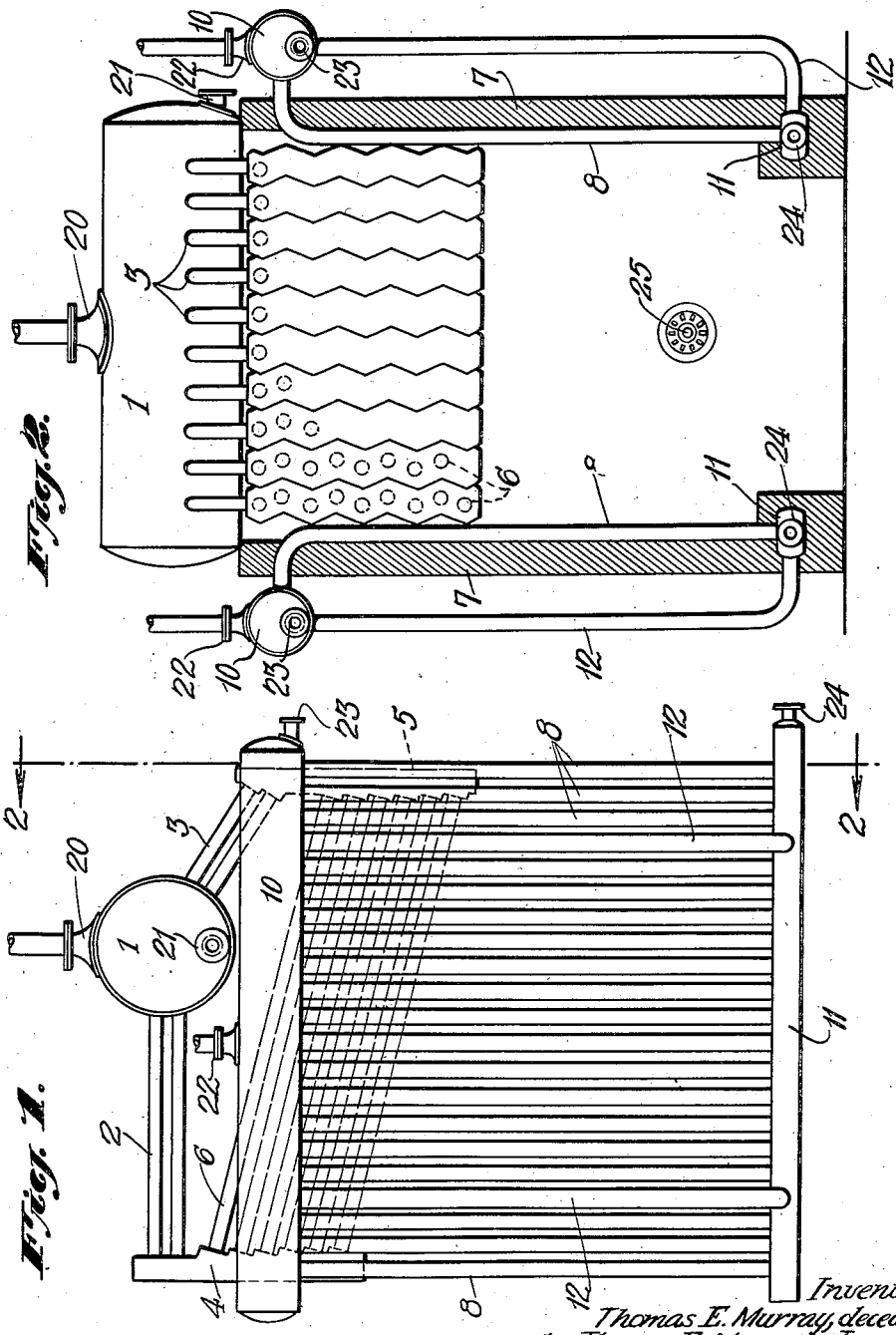

Fig. 2.

Fig. 1.

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BOILER

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1 Claim. (Cl. 122—235)

The invention provides a steam generator having a plurality of generating units carried in the same casing and utilizing simultaneously the heat from the same fire.

In a previous application 673,654, filed November 9, 1923, there is described such an installation in connection with turbines or other engines for taking off the steam at different pressures.

The present application is a division thereof, directed to the steam generator without reference to the instrumentalities for utilizing the steam.

The accompanying drawing illustrates an embodiment of the invention.

Fig. 1 is a side elevation of the generator, omitting the casing;

Fig. 2 is a section of the generator, approximately on the line 2—2 of Fig. 1.

The steam generating unit comprises within a single casing steam generating elements arranged in two independent circuits.

What may be called the main part of the steam generating unit is shown as a standard boiler with a drum 1 connected by tubes 2 and 3 with headers 4 and 5 between which are arranged the inclined water tubes 6. The products of combustion, or other heating gases, are confined between the walls 7 so as to pass up through the tubes 6 and out to a stack by any usual or suitable arrangement.

In addition there are two supplementary steam generating units comprising tubes 8 located at the sides of the heating chamber 9 so as to be exposed to the hot gases and insulated from the outside air by the walls 7 of brick, magnesia, or other suitable material. These side wall tubes are connected at the top to drums 10 and at the bottom to headers 11. The drums and headers are connected on the outside by circulating pipes 12. Thus their circulation is independent of that in the main boiler.

Each generating unit contains its own separate water tubes and circulating pipes for taking wet steam from said tubes and returning water thereto, the water tubes for the several circuits being in the same casing.

The tubes 8 are exposed throughout a great part of their length to the radiant heat of the burning fuel in the combustion chamber 9. A comparatively energetic circulation is thus set up in these tubes. The tubes 6 are heated chiefly by convection from the hot gases passing between them. In this bank of tubes, therefore, there is a less energetic circulation set up. In the operation of the apparatus, therefore, interference is avoided between the circulation in the tubes which are most active because of their exposure to the radiant heat and their first coming into contact with the burning gases, and the tubes which are less active.

Any usual or suitable superheater arrangement may be provided. The steam may be taken off at different pressures from the different circuits as described in the previous application above referred to.

The present generator works at a high efficiency. Generally speaking, the use of a high temperature flame is less economical than the use of a low temperature flame, or heating gas. With the present installation, the temperatures within the combustion chamber 9 may be maintained at a very high point. In fact with the tubular water walls at the sides this is a very efficient method of generating steam rapidly and in large quantities. Nevertheless, the heating gases are again used in passing through the bank of tubes 6 so that their temperatures are further reduced before going to the stack. In the operation of the complete installation, therefore, the fuel is used with high efficiency.

The generating units, of course, would include standard accessories, such as non-return valves, feed-water valves, and blow-off valves.

The steam outlet for the bank of tubes 6 is indicated at 20 and its feed-water inlet at 21. The steam outlets for the walls of tubes 8 are indicated at 22 and the feed-water inlets at 23. The blow-off from the drums 11 is shown at 24.

Generally the apparatus will be used to provide two (or three) separate supplies of steam. There is shown no circulating connection between the several units, but such a connection may be made at any one of various points if it be desired to adapt the apparatus to the utilizing of the entire heating surface for the generation of a single supply of steam.

The generator may be heated by the usual or any suitable heating means, such as grate firing or powdered coal or similar fuel injected through nozzle burners. A nozzle burner 25 is shown in Fig. 2 in end view at one end of the furnace. The casing, of course, will be completed so as to direct the heating gases after they pass through the overhead bank of tubes to the stack and so as to remove ashes.

The drums 10 in which the steam and water from the upright tubes 8 are collected are arranged entirely outside of the wall 7, or other setting or enclosure for the pressure elements of the boiler. The headers 24 which serve as the com-

mon junctions for the lower ends of the upright tubes are protected by the refractory material from the heat within the furnace, although they are not entirely outside of the wall or setting. The water-return tubes 12 are also outside of the setting. It is only the steam generating tubes 8 that are exposed to the radiant heat of the burning gases within the furnace. A wall of this sort has particular advantages in generating a large volume of steam rapidly and may be used in many other arrangements than that illustrated.

Various modifications may be made by those skilled in the art without departing from the invention as defined in the following claim.

What is claimed is:

A steam generator having nozzle burners for projecting powdered coal or the like into the combustion chamber, a plurality of independent circuits each containing its own separate steam generating tubes and circulating connections, the steam generating tubes for the independent circuits being in the same casing, said casing comprising a wall of insulating material, at least one of said circuits comprising a set of upright steam generating tubes having metal surfaces exposed to the radiant heat of the burning fuel in the combustion chamber and having top and bottom headers which are protected from such radiant heat and are connected directly to the ends of the tubes, and direct water-return connections from the upper header to the lower one so as to effect a very rapid circulation and generation of steam and to prevent overheating of said tubes.

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