Oct. 10, 1933. H. C. HEATON 1,929,424

FUEL BURNING FURNACE

Original Filed June 15, 1926 2 Sheets-Sheet 1

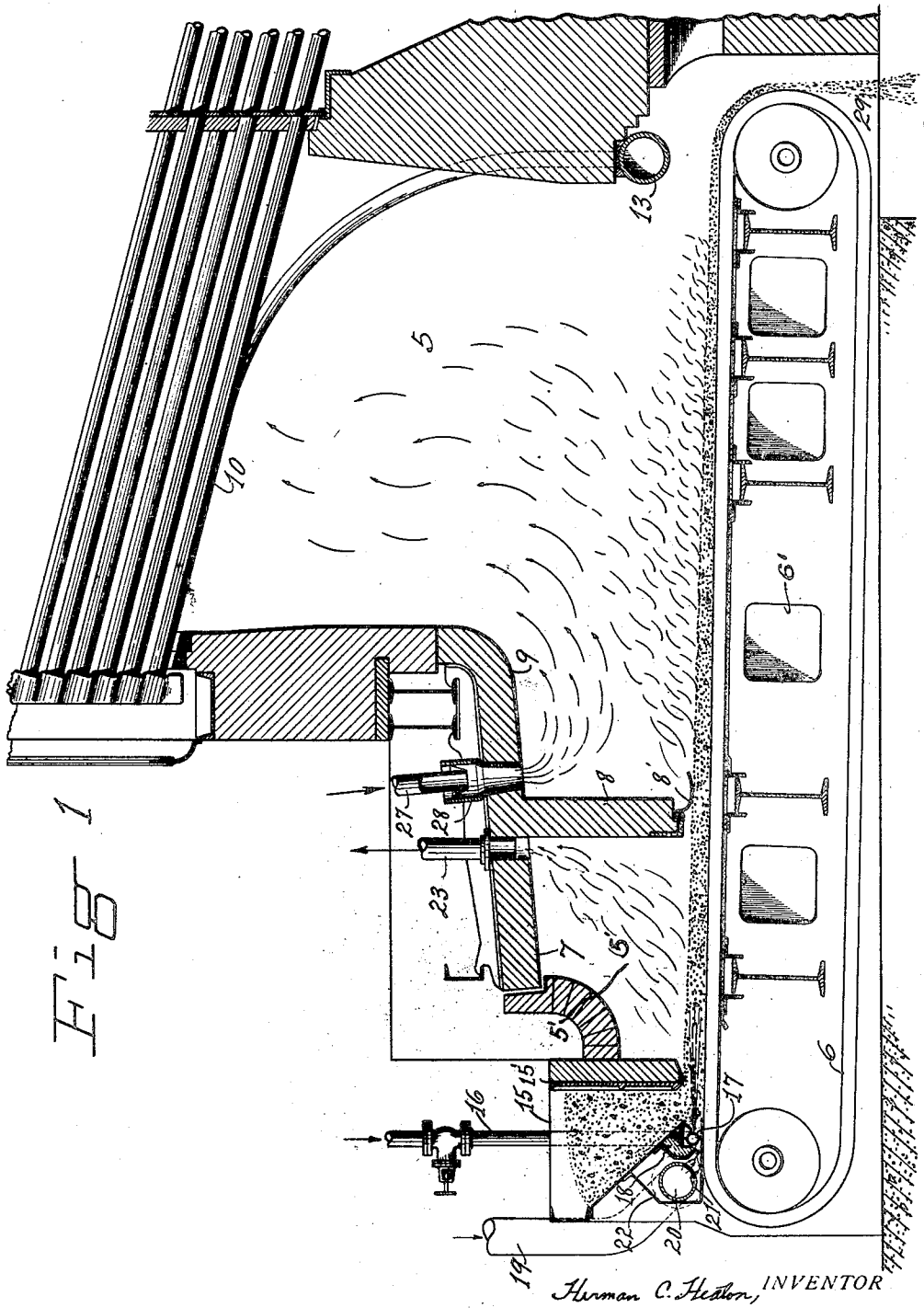


Fig. 1

Herman C. Heaton, INVENTOR

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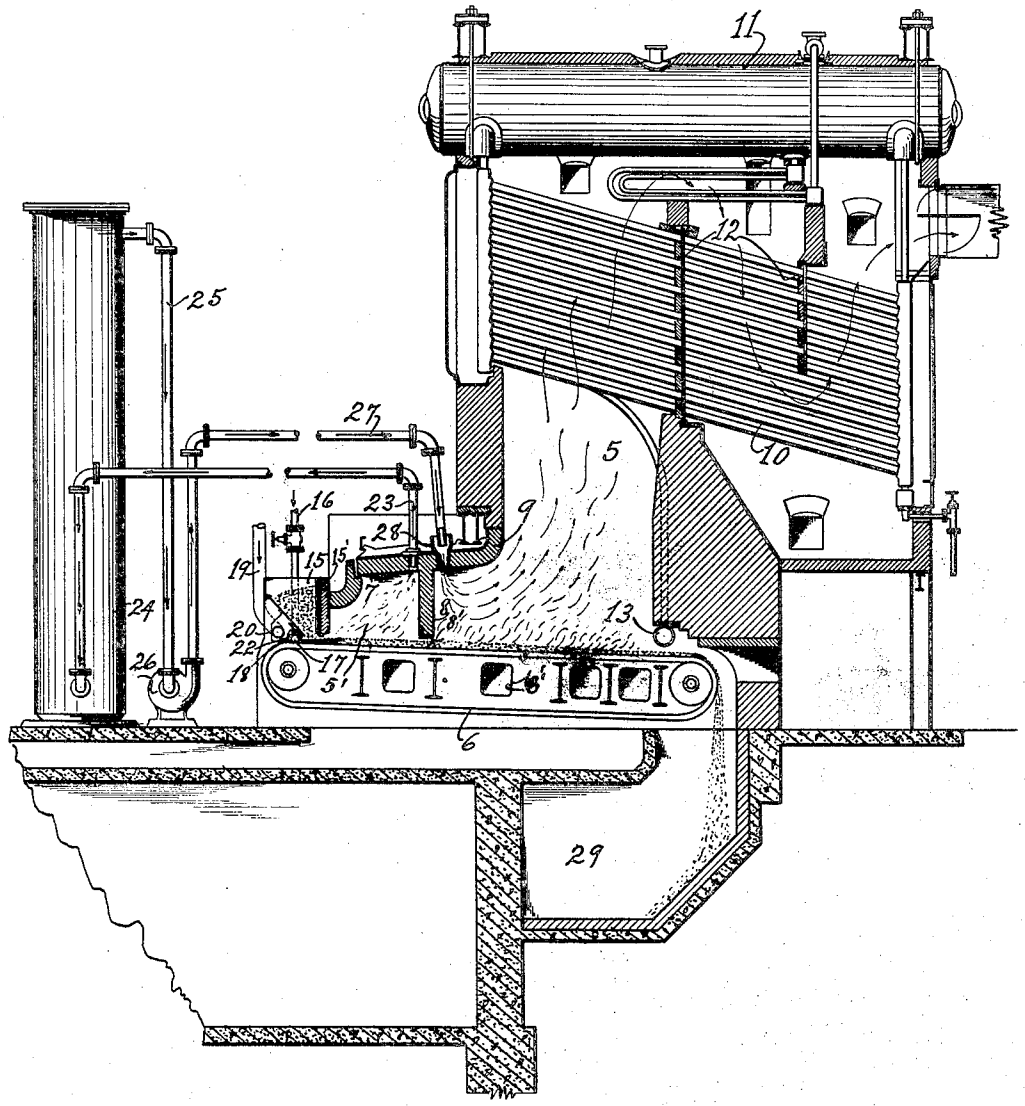
Gifford & Scull, ATTORNEYS

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Fig. 2.



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FUEL BURNING FURNACE

Herman C. Heaton, Chicago, Ill.

Application June 15, 1926, Serial No. 116,078
Renewed January 3, 1933

5 Claims. (Cl. 110—22)

This invention relates to a furnace that is adapted for steam boilers, in which solid fuel is burned and valuable by-products are recovered from the fuel. The invention will be understod from the description in connection with the accompanying drawings, in which Fig. 1 is a vertical section through an embodiment of the invention, and Fig. 2 is a similar section on a smaller scale showing additional features.

In the drawings, reference character 5 indicates the combustion chamber of a furnace that is provided with a chain grate stoker 6. The stoker may be provided with air boxes 6' of the well-known type to enable regulated quantities of air to be fed through the upper run of the stoker to the fuel, the regulation being achieved by the usual dampers, not shown. The furnace is provided with an extension 7, over the front end of the stoker, and a wall or baffle 8 extends from the combustion arch 9 of the extension downwardly to a short distance from the upper run of the chain grate stoker 6, thus separating the space above the grate into two compartments, the combustion chamber 5 and a heating or igniting chamber 5'. A gas seal plate 8' extends from the lower end of baffle 8 downwardly to prevent escape of gases under the baffle 8. A water tube steam boiler of well-known type comprising inclined tubes 10, a drum 11 and baffles 12 may be installed above the furnace, so as to be heated thereby. A water tube 13 connected to the circulatory system of the boiler may be located in the rear of the furnace near the rear end of the stoker 6 to cool the same and protect the rear wall of the furnace.

A feed inlet or hopper 15 for solid fuel is provided near the front end of the chain grate stoker, and its rear wall is provided with an adjustable slide or gate 15' to regulate the thickness of the layer of solid fuel that is fed to the stoker. A valved pipe 16 is located in front of the hopper and a cross pipe 17 at the end thereof is provided with holes on the side toward the fuel feed, this pipe being connected to a fluid fuel source, such as gas, or oil, or powdered fuel. A refractory wall 18 extends along the front of the pipe 17. An air supply pipe 19 terminating in a cross pipe 20 with holes 21 along its rear side is disposed on the front side of the wall 18. A casing 22 extends around the pipe 20 and a short distance below the wall 18 and pipe 17. The front edge of the hopper may be slightly spaced from the upper run of the chain grate stoker 6 to enable the fuel leaving the pipe 17 and the air leaving the pipe 20 to enter the solid fuel on the top run of the stoker.

A pipe 23 leads from the space between the hopper 15 and wall 8 to a by-products recovery device 24 of any suitable type, by which valuable products may be recovered from vapors and gases. An outlet pipe 25 leads from the by-products recovery device 24 to a pump 26, from which a pipe 27 leads into an inlet 28 through the combustion arch 9 behind the wall 8.

The operation is as follows: Solid fuel containing valuable volatile constituents, such as coal, for example, is fed through the hopper 15 to the upper run of the chain grate stoker 6, upon which it forms a bed which is carried into the furnace, it being understood that the upper run of the grate is moved towards the right as shown in the drawings, this movement being caused by the usual sprocket wheels indicated in the drawings. The fluid fuel, such as gas, or oil, or powdered fuel fed through the pipe 16 is ignited after it passes through the holes 17 in the cross pipe, air being fed in through the pipe 20 for combustion purposes, and the hot products heat the solid fuel on the stoker, thus causing volatile products therefrom to rise and pass through the pipe 23 into the by-products recovery device 24 where the valuable products therein are separated. The uncondensed gases from the volatile constituents pass out of the pipe 25 and are forced by means of the pump 26 through the inlet 28 into the combustion space of the furnace where they are burned and the heat therefrom is available for heating the boiler.

The residue of the solid fuel from which volatile constituents have been removed, as just described, are carried by the chain grate stoker under the lower edge of the wall 8, and are burned on the upper run of the chain grate stoker, in the usual manner, the ashes and slag falling into the ash pit 29. Besides enabling valuable by-products to be recovered from the solid fuel, this invention enables the chain grate stoker to be operated at a higher speed, and the boiler to be operated at a higher rate, as the fuel is burned immediately after volatile constituents are removed therefrom before the fuel has cooled off.

A sufficient amount of air is supplied through the boxes 6' to cause combustion of the fuel in the chamber 5 and sufficient air is also supplied to the chamber 5' to permit ignition of the fuel therein. It will be noted that one of the boxes 6' is placed beneath this chamber or compart-

ment 5' for the above purpose. The result is two chambers 5 and 5' separated by the wall 8, and through these chambers is moved a bed of fuel which is ignited in the chamber 5' and then burned in the combustion chamber 5. The chamber 5' is in effect a partial combustion chamber although the amount of air is kept low so as to permit recovery of the volatile elements which are driven off by the heat. The fuel on the bed in the chamber 5' is therefore in such a condition that it will burn much more rapidly when it reaches the chamber 5 and therefore the stoker may be operated at a higher rate of speed. The heat from the bed in the chamber 5 will work back beneath the wall 8 and seal 8' and be conveyed through the bed to that portion of the bed in the chamber 5'. After operation has continued for a time the source of fuel provided by the pipe 17 may be shut off and the operation will continue, the heat in the chamber 5' then being supplied directly from the bed. It will also be seen that the two chambers 5 and 5' are under different pressures, the different pressures being maintained by the suction through the pipe 23 and the force of the gases passing through the pipe 27, and also by regulation of the boxes 6'. By this means the ignition and burning of the fuel in the two chambers may be controlled.

Various modifications or changes may be made without departing from the spirit or scope of this invention.

I claim:

1. In combination, a chain grate stoker for supporting a moving bed of fuel, means comprising a transverse wall extending above the bed of fuel for providing a front compartment and a rear compartment separated therefrom and located above said stoker, a fluid fuel burner located immediately above the front end of said stoker for raising the temperature of the fuel in said front compartment, means for recovering volatiles liberated therein, the residue of the solid fuel being burned in said rear compartment.

2. In a furnace, a chain grate stoker, means for delivering solid fuel to the front end of said stoker, means comprising a fluid fuel burner for heating the solid fuel on the front end of said stoker, means forming two separated chambers located above the upper run of said chain grate and longitudinally thereof and following said means for heating the solid fuel, means for removing volatile products from the first of said chambers, the residue of the solid fuel from the first chamber being burned in said second chamber.

3. In a furnace, a chain grate stoker, means for delivering solid fuel to the front end of said stoker, means comprising a fluid fuel burner for heating the solid fuel on the front end of said stocker, means forming two separated chambers located above the upper run of said chain grate and longitudinally thereof and following said means for heating the solid fuel, means for removing volatile products from the first of said chambers, means for recovering volatile constituents from said products, the residue from the solid fuel from the first chamber being burned in said second chamber.

4. In a furnace, a chain grate stoker, means for delivering solid fuel to the front end of said stoker, means comprising a fluid fuel burner for heating the solid fuel on the front end of said stoker, means forming two separated chambers located above the upper run of said chain grate and longitudinally thereof and following said means for heating the solid fuel, means for removing the products resulting from heating the fuel from the first of said chambers, means for recovering volatile constituents from said products and means for returning other constituents from said volatile products to the second chamber to assist in burning the solid fuel therein, the residue of the solid fuel from the first chamber being burned in the second chamber.

5. In combination, a chain grate stoker for supporting a moving bed of fuel, a wall extending transversely of said bed and dividing the space thereabove into a front and rear compartment with respect to the movement of the bed of fuel, a fluid fuel burner located immediately above the front end of the said chain grate stoker and in advance of said front compartment for heating the fuel, means associated with said front compartment for recovering constituents of the volatile products liberated in said front compartment, the residue of fuel from said compartment being burned in said rear compartment as the fuel bed moves thereinto.

HERMAN C. HEATON.