No. 664,304. Patented Dec. 18, 1900.

W. B. WILKINSON.

METHOD OF GENERATING HEAT BY COMBUSTION OF FUEL.

(Application filed June 20, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

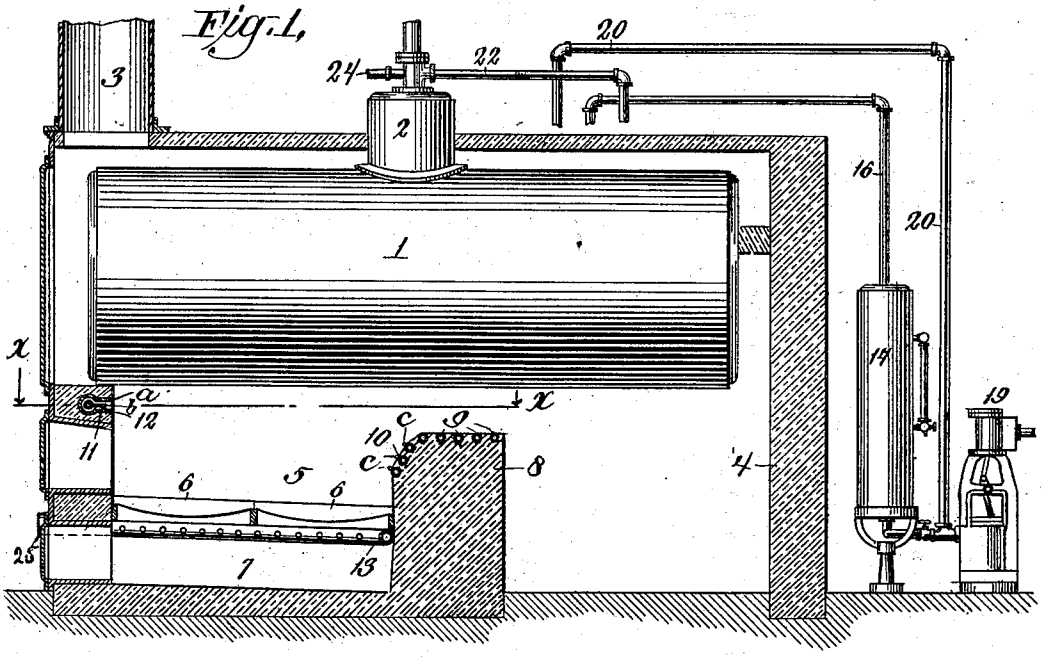

Fig. 2.

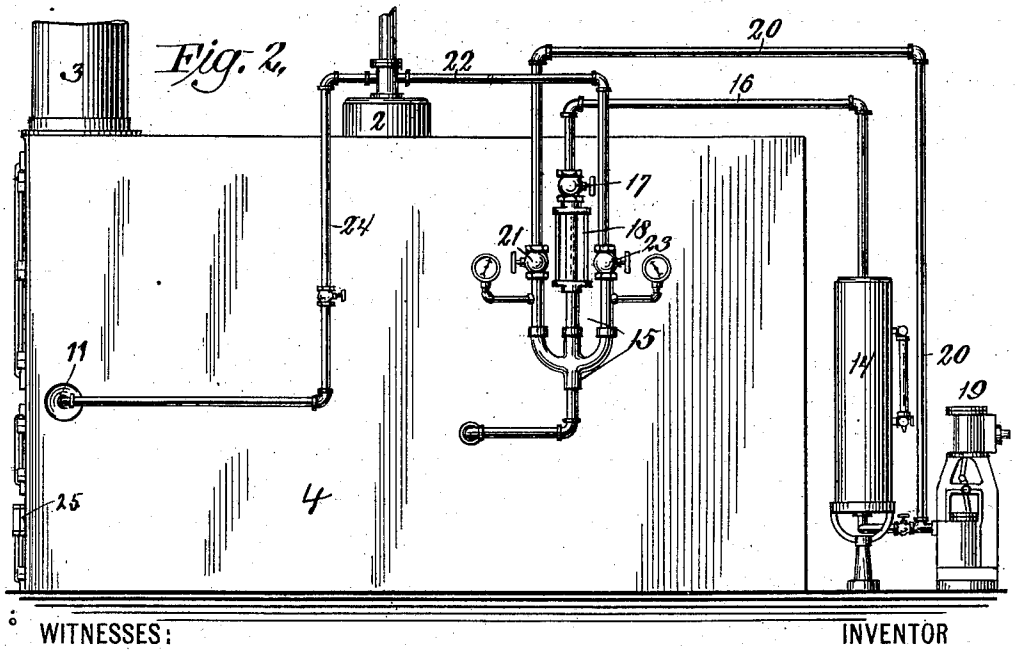

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Fig. 3,

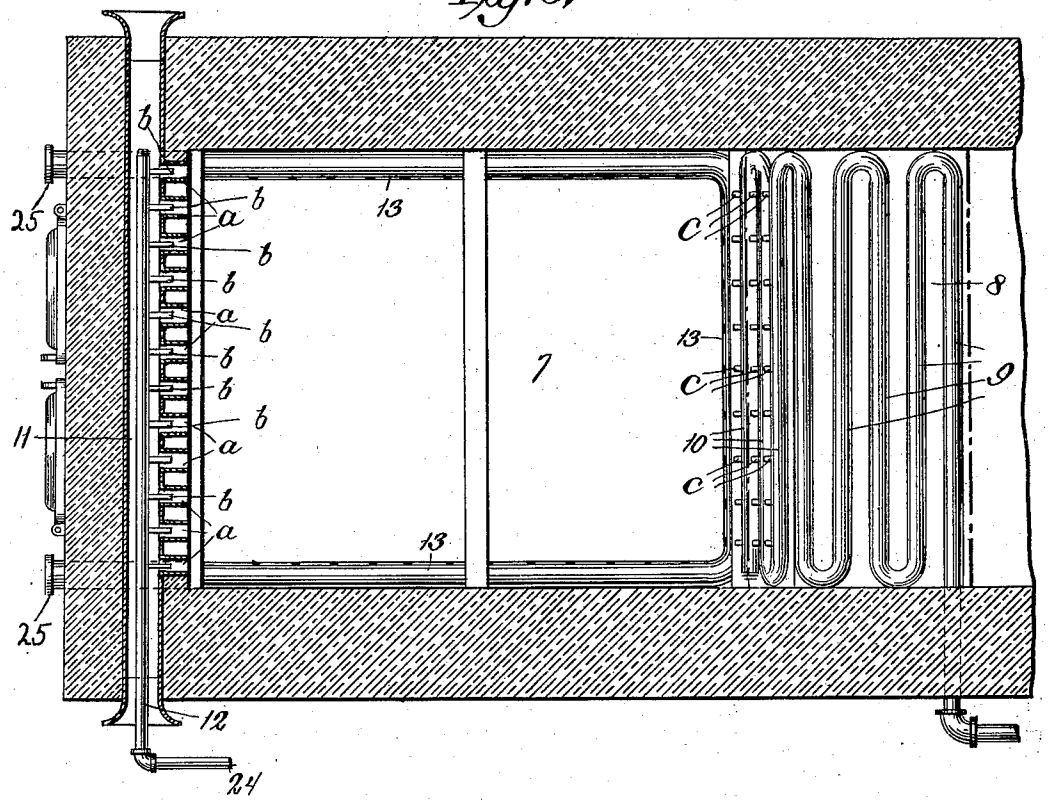


Fig. 4,

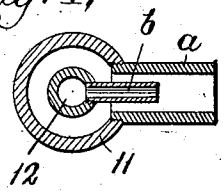
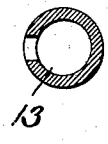


Fig. 5,



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WILBUR B. WILKINSON, OF NEW YORK, N. Y.

METHOD OF GENERATING HEAT BY COMBUSTION OF FUEL.

SPECIFICATION forming part of Letters Patent No. 664,304, dated December 18, 1900.

Application filed June 20, 1900. Serial No. 20,947. (No model.)

To all whom it may concern:

Be it known that I, WILBUR B. WILKINSON, a citizen of the United States, residing in the borough of Brooklyn, New York city, State of New York, have invented certain new and useful Improvements in Methods of Generating Heat by the Combustion of Fuel, of which the following is a full, clear, and exact specification.

My invention relates to an improved method of generating heat by the combustion of hard fuel whereby a more economical and effective consumption of fuel is obtained, smoke practically done away with, and more heat efficiency obtained per pound of fuel than has heretofore been obtained in any ordinary furnace.

My method consists in the supplying of sufficient air and steam to coöperate with hydrocarbon gas in order to accomplish suitable and economical combustion, and, furthermore, in a new and original method of distributing and supplying the hydrocarbon gas among and to the escaping fuel elements.

I shall first refer to the drawings, describing in connection therewith one form of apparatus designed for carrying out my improved method and then set forth my method more in detail.

In the drawings, Figure 1 is a side elevation of a horizontal-boiler furnace, partly in section. Fig. 2 is a side elevation of a furnace, showing the outside connections. Fig. 3 is a horizontal section of the furnace along the line *x x* of Fig. 1, the grate-bars being removed. Fig. 4 is a sectional view of the air-heating chamber, and Fig. 5 is a sectional view of the air-supply pipe.

Similar characters refer to similar parts throughout the several views.

1 is an ordinary horizontal tubular boiler having a steam-dome 2.

3 is a smoke-outlet.

4 is the furnace-wall.

5 is the combustion-chamber of the furnace.

6 6 are grate-bars on which the hard fuel to be consumed is supported.

7 is an ash-pit.

8 is the bridge-wall, having the hydrocarbon-generator 9 and perforated hydrocarbon-gas-escape pipes 10 embedded in it at or near the top.

11 is an air-heating chamber containing steam-pipe 12.

13 is an air-supply pipe on the walls of the ash-pit.

14 is an oil-tank connecting to injector 15 by pipe 16, having needle-valve 17 and sight-feed 18.

19 is a compressed-air pump for forcing the oil from tank 14 through pipe 16 and also for supplying compressed air to injector 15 through pipe 20, controlled by valve 21. Pipe 22 conducts the steam from steam-dome 2 to injector 15 and is controlled by valve 23. Tank 14 and pipes 20 and 22 each have suitable indicators for showing pressure. Pipe 24 conducts steam from steam-dome 2 to steam-pipe 12 in air-heating chamber 11. Air-heating chamber 11 is embedded in the front wall of the furnace and is open at each end, so as to communicate with the outside air.

Should it be impossible for air-heating chamber 11 to extend from side to side of the furnace, as shown in Fig. 3, the air-inlets being at the ends of the chamber, then the ends of the chamber may be turned at right angles and the air-inlet ports be on the front of the furnace.

The air-heating chamber 11 is provided with nipples *a a a a*, extending through the furnace-wall to combustion-chamber 5, while steam-pipe 12 is also supplied with nipples *b b b b*, extending a short distance into the nipples *a*. The air-supply pipe 13, as shown at 25, is also open to the outside air at each end, appropriate holes being drilled through the front wall of the furnace, if necessary. Hydrocarbon-gas-escape pipes 10 are also provided with nipples *c c c c*, extending through the edge of the bridge-wall to the combustion-chamber.

I shall now describe the operation of the apparatus in carrying out my improved method. The fuel on the grate-bars 6 6 is ignited, and after it has been burning long enough to generate steam in the boiler the valves 23 and 17 are opened and the steam and oil enter the injector 15, whence they pass to hydrocarbon-generator 9. I have placed the hydrocarbon-generator in the top of the bridge-wall, where it is exposed to the gases escaping from the combustion-chamber, sufficient heat being thus supplied to super-

heat and volatilize its contents. The volatilized hydrocarbon gas with the heated air, if any air has been admitted through pipe 20 and valve 21, and superheated steam, then passes into gas-escape pipes 10, placed in the front slope of the bridge-wall, whence they escape into the combustion-chamber through the nipples or perforations *cccc*. The hydrocarbon gas, with the accompanying air and steam, is thus conducted to a point where it meets and cuts across the path of the escaping gases from the fuel elements as they pass upward from the combustion-chamber, mingles with them, burns them, increases the heat and decreases the smoke, while the superheated escaping gases passing over the generator in the top of the bridge-wall serve to assist in the volatilization by means of which the hydrocarbon gas is produced; but the introduction of hydrocarbon gas alone, with its accompanying air and steam, is not sufficient to produce perfect combustion.

An excess of oxygen must be provided for the escaping gases, which consist for the most part of carbonic oxid. To this end I have placed an air-heating chamber 11 in the front wall of the furnace under the boiler. The air passing into the chamber from either end is heated to a very high temperature by the fire in the furnace and escapes through nipples *a a a a* into the combustion-chamber, uniting with the carbonic oxid and supplying sufficient excess to cause almost perfect combustion in connection with the hydrocarbon gas. A steam-pipe may be passed through the air-heating chamber, the pipe having a number of escape jets or nipples *b b b b*, permitting the steam to be injected into the combustion-chamber, thus supplying an additional quantity of oxygen and hydrogen, as well as serving to heat the air in the air-heating chamber.

To increase the air-supply from beneath the grate, I have placed a perforated air-supply pipe 13 on the wall of the ash-pit close up to the grate-bars 6 6. This air-supply pipe, communicating directly with the outer air, is heated by the fire, and the hot air escaping from the perforations passes upward through the grate-bars into the fire, producing a partial combustion and decomposition of the fuel. The air-supply pipe serves to provide a steady supply of air from beneath the grate, for if the ash-pit door is closed the air still passes through the pipe into the fire. The hydrocarbon gas might also be permitted to escape beneath the grate as well as into the combustion-chamber from the front of the bridge-wall, in either case the excess of oxygen supplied by the air-heating chamber in the furnace-wall resulting in more perfect combustion. I prefer, however, to permit the gas to escape from the front slope of the bridge-wall only.

I do not restrict myself to the operation of my method in connection with horizontal tubular boilers only, as it can be applied as well to other kinds of boilers.

In this application I do not claim the apparatus herein described and shown, as I have reserved the same for the subject of another application.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The method of producing combustion of solid fuel consisting first, in supplying air thereto from below the fuel to assist in producing a partial combustion and decomposition of the fuel; second, in supplying air and steam from above the fuel to the gaseous fuel elements arising therefrom, and third, in supplying vapors of a hydrocarbon to the escaping gases.

2. The method of producing combustion of solid fuel consisting first, in supplying heated air thereto from below the fuel to assist in producing a partial combustion and decomposition of the fuel; second, in supplying air and steam from above the fuel to the gaseous fuel elements arising therefrom, and third, in supplying vapors of a hydrocarbon to the escaping gases.

3. The method of producing combustion of solid fuel consisting first, in supplying heated air thereto from below the fuel to assist in producing a partial combustion and decomposition of the fuel; second, in supplying heated air and steam from above the fuel to the gaseous fuel elements arising therefrom, and third, in supplying vapors of a hydrocarbon to the escaping gases.

4. The method of producing combustion of solid fuel consisting first, in supplying air thereto from below the fuel to assist in producing a partial combustion and decomposition of the fuel; second, in supplying air and steam from above the fuel to the gaseous fuel elements arising therefrom, and third in introducing the vapors of a hydrocarbon to the escaping gases in a direction across the path of said gases.

In witness whereof I have hereunto signed my name in the presence of two witnesses.

WILBUR B. WILKINSON.

Witnesses:

SEABURY C. MASTICK,

EDWARD T. PHILLIPS.