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E. J. VRAALSTAD & W. L. DOYLE.

HYDROCARBON FURNACE.

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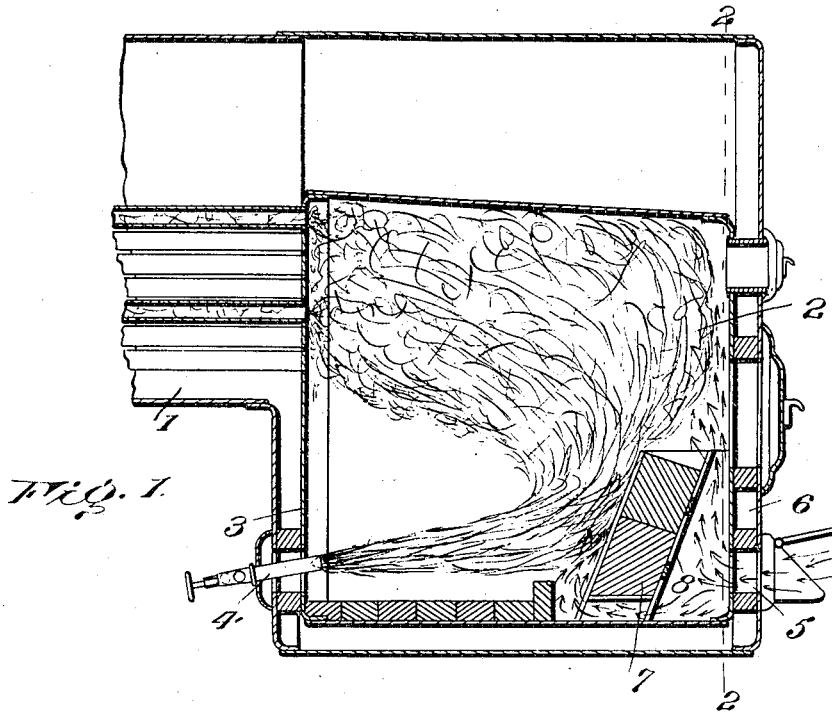
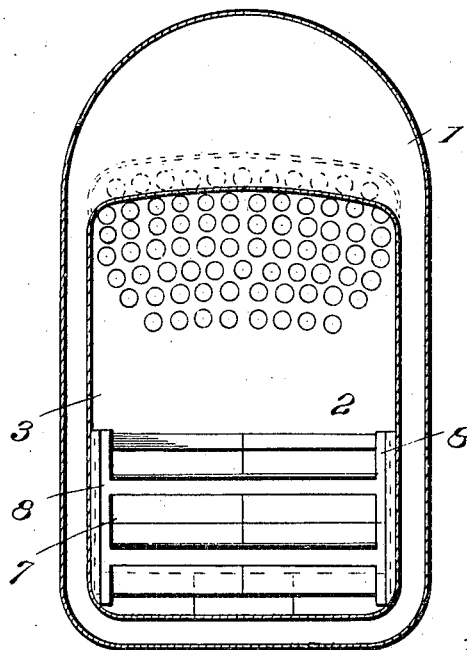


FIG. 2.



Witnesses

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354

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# UNITED STATES PATENT OFFICE.

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## HYDROCARBON-FURNACE.

No. 825,779.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that we, EDWARD J. VRAALSTAD and WILLIAM L. DOYLE, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Hydrocarbon-Furnaces; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The primary object of this invention is to provide a hydrocarbon-furnace with improved means for effecting the thorough combustion of the fuel to obtain and utilize the maximum heat-producing properties thereof for the generation of steam.

A further object contemplates constructing the furnace fire-box and introducing the fuel therinto so that the latter may circulate in and fill the box before passing to the flues and receive at the same time a thorough mixture of air, rendering unnecessary the use of retarding arches or projections ordinarily employed, and a further object is to obviate the tendency of the fuel overheating the casing by contacting in jets with any one point thereof and protect the doors in the outer wall of the fire-box from the action of the heat.

In the accompanying drawings, Figure 1 shows in vertical section a furnace fire-box constructed in accordance with our invention. Fig. 2 is a transverse section on line 2, Fig. 1.

Referring to the drawings, 1 designates a portion of a tubular steam-boiler, and 2 the fire-box or combustion-chamber, the latter being shown as provided near the lower end of its inner or front wall 3, beneath the inlets to the flues, with an orifice to accommodate the fuel-burner 4. Although the fuel is discharged directly adjacent to the front wall of the fire-box, the supply-pipe may be carried in at any point.

5 designates a draft-opening near the lower end of the outer or rear wall 6 of the fire-box, about in direct line with the fuel-inlet. Thus the fuel-inlet and openings to the flues are in one wall of the box and the air-inlet in the opposite wall.

A baffle or deflector is indicated at 7. This consists of an inclined wall, preferably of fire-brick, disposed transversely of the fire-box in

line with the draft-opening 5 and burner 4 and supported at its extremities by channel-bars 8, secured to the side walls of the box. The baffle is set away from the outer or rear wall and bottom of the fire-box to provide spaces for the air to pass between it and said outer wall, as well as between it and the bottom of the fire-box. The disposition of the baffle and burner 4 is such that the discharge from the latter is ejected against the baffle, by which it is deflected toward the top of the fire-box.

As the atomized hydrocarbon is ejected from the burner and toward the rear end of the fire-box and away from the tube-sheet it is met by an air-current entering in the direction of the tube-sheet, thereby turning the flame toward the tube-sheet and supplying the necessary oxygen for completing the combustion. Some of the air is introduced beneath the baffle, while that which passes over the baffle not only furnishes a further supply, insuring perfect combustion, but by passing upwardly between the baffle and the outer wall of the fire-box protects the latter from the intensity of the heat. This is of primary importance, since owing to the large area taken up by the doors in this wall it is not possible to provide sufficient jacketing to protect the doors from burning out in fire-boxes of the type constructed for using coal, wood, or straw as the fuel. Since the fuel enters the fire-box in the opposite direction to that which it must take to reach the flues and being deflected upwardly, the flame circulates through and entirely fills the box before entering the flues, while its being supplied with air at the point farthest from the flues insures thorough combustion while the gases are yet within the confines of the box. In consequence the use of the ordinary brick walls or arches within the fire-box is unnecessary. The combustible elements in taking the long course from their point of delivery to the flues of the boiler are practically consumed and impinge upon the flue-sheet of the boiler as products of combustion and not as a mixture of gaseous elements and air. The oxygen of the air is substantially all combined with the carbon and hydrogen of the fuel within the fire-box proper, so that the oxidizing effect upon the flue-sheet and the flues themselves is very much reduced.

It will be noted that against no point of the casing or walls of the fire-box is the flame directed in a concentrated jet. Thus the integrity of the fire-box is preserved. It will further be noted that this preservation of the fire-box is not at the expense of cooling the flame before entering the flues. Practice has demonstrated that by the described arrangement the outer wall of the fire-box is preserved even without the employment of a water-jacket, and the otherwise unprotected doors are protected from injury.

We claim as our invention—

1. The combination, with a steam-boiler having a fire-box which is unobstructed by arches or projections and closed at its bottom, of means for delivering a hydrocarbon flame rearwardly into the fire-box, and means for establishing a draft of air into and at the other end of the fire-box and at substantially right angles to the course of the flame.

2. In a boiler-furnace, the combination of a fire-box unobstructed by arches or projections to the passage of the combustible gases, a draft-opening in the floor of the fire-box and located rearwardly of and at a substantial distance from the front end thereof, a hydrocarbon-burner at the front end of the fire-box and discharging rearwardly thereinto above the floor at right angles to the air-inlet and in a direction opposed to the draft leaving the fire-box.

3. The combination, with a steam-boiler having a fire-box which is unobstructed by arches or projections and closed at its bottom, the tube-sheet of the boiler being at the forward end of the fire-box, of means for delivering a hydrocarbon flame into the fire-box toward the rear end thereof and away from the tube-sheet, and means located substantially adjacent to the rear end of the fire-box for establishing a draft of air against the

flame and in the direction of the tube-sheet thereby turning the flame toward the tube-sheet and supplying the necessary oxygen for completing the combustion.

4. The combination, with a steam-boiler having a fire-box which is unobstructed by arches or projections and closed at its bottom, of a hydrocarbon-burner discharging rearwardly into the fire-box at or near the front end thereof, and a draft-opening formed in the bottom of the fire-box toward the rear end thereof.

5. In a tubular hydrocarbon-furnace, a fire-box into which the tubes or flues open having an inlet for the fuel beneath the open ends of such tubes, a baffle or deflector in line with the discharge from such inlet, such baffle being set away from the bottom and next adjacent wall of the fire-box to provide air-passages, and means for admitting air thereto.

6. In a hydrocarbon-furnace, in combination, a fire-box through the front wall of which the flames pass to the boiler, means for supplying a hydrocarbon fuel in close relation to said wall beneath the entrance of the flames to the boiler-flues, means for admitting air through the outer wall of the fire-box about in line with the discharge of the hydrocarbon fuel, and a baffle intermediate the points of admission of the air and the hydrocarbon fuel, spaces being formed between said baffle and the bottom and the outer wall of the fire-box.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

EDWARD J. VRAALSTAD.  
WILLIAM L. DOYLE.

Witnesses:

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M. J. TODD.