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E. C. VOORHEIS.

FLUID FUEL FURNACE.

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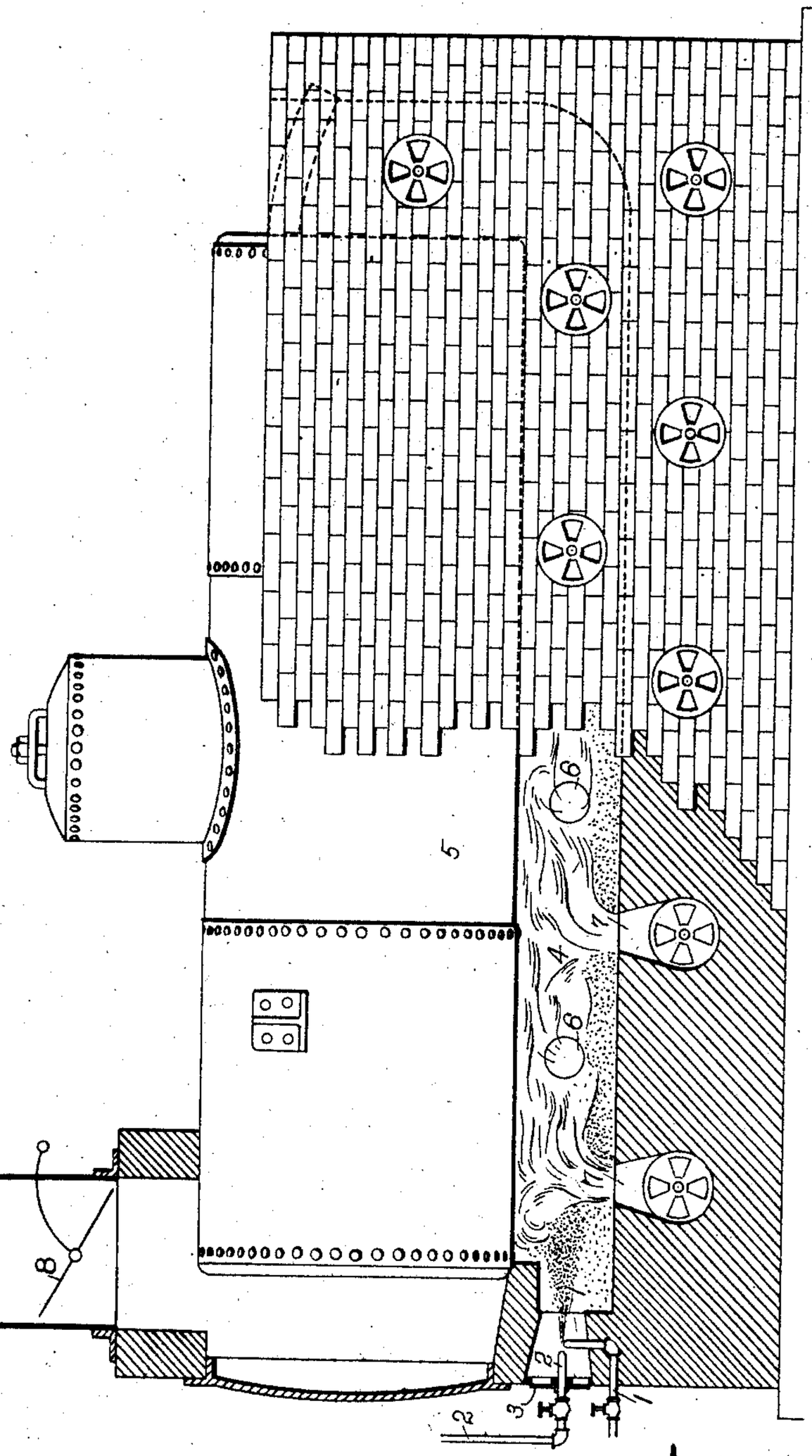

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FLUID-FUEL FURNACE.

No. 883,260. Specification of Letters Patent. Patented March 31, 1908.

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To all whom it may concern:

Be it known that I, EDWARD C. VOORHEIS, citizen of the United States, residing at Sutter Creek, in the county of Amador and State of California, have invented certain new and useful Improvements in Fluid-Fuel Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to improved liquid or gaseous fuel burning arrangements for boilers, stoves, furnaces and other constructions in which such fuel is used.

The difficulty which is encountered in the employment of liquid hydro-carbons as fuel relates particularly to the extreme local intensity of the flame as heretofore employed. A great variety of devices, arrangements and constructions have heretofore been employed, such as fire-brick wall, etc., against which the intense flame is directed and which are thereby raised to high temperature for the purpose of delocalizing the heat and distributing it throughout the fire-box. Besides this, in its multitudinous forms, deflecting or baffling plates in almost endless variety are also employed, all with more or less imperfect practical success.

There is an underlying principle common to all these methods of utilizing fluid, vaporized or gaseous fuel and to all the other means which have heretofore been employed in this connection, viz., the atomizing in the case of liquid fuels and the immediate mingling in both liquid and gaseous fuel with the necessary complement of atmospheric air or other oxygen carrying medium to supply the oxygen necessary for perfect combustion at or adjacent to the fuel outlet or burner nozzle. This principle or method necessarily entails a blow-pipe form of flame with its intensely local and destructive heat.

Were the object of the ordinary boiler furnace the same as that of a melting furnace, the methods heretofore of burning the fuel would be all that could be desired, but this is not the case, for, whereas a heat of several thousand degrees is desirable and necessary in the employment of the fuel in the last mentioned case. In the boiler and analogous devices on the contrary but several hundred degrees are all that is needed.

One of the objects therefore of the present invention is to provide a simple and efficient arrangement for the burning of fluid fuel whereby the combustion and the resulting temperature may be regulated to suit the requirement for which the fuel is being employed.

The present invention is based upon the application of a principle new in this character of devices and which involves practically the opposite of the methods heretofore employed in utilizing fluid fuel.

In the chemistry of combustion, it is a principle that two gases, the admixture of which renders them inflammable are equally so, irrespective of which is introduced as the burning gas. In other words, in a hydro-carbon gaseous atmosphere, air burns with the same facility that a hydro-carbon gas burns in air. It is also true that with an insufficient supply of oxygen a low or incomplete condition of combustion is maintained. Further it is true that a considerable range in proportion of the oxygen carrying air will sustain combustion in a varying and proportionate degree of intensity. Another fact is that in a body of inflammable gas, a condition of incandescence may exist locally in various parts of the mass independent of each other. It is upon these principles that the novel method and construction of the present invention is based and which constitute it a radical departure in the employment of fluid fuel.

The objects of the present invention are accomplished by means of the devices illustrated in the accompanying drawing which is a side elevation of a boiler and setting showing my improved construction, portions being broken away to more clearly illustrate it.

Referring to the drawing, 1 is a fuel supply pipe. 2 is a pipe for steam or other atomizing fluid under pressure. The nozzle of these two pipes are adjacent to each other and may be arranged in any suitable way to constitute an efficient spraying or atomizing arrangement. 3 is an inlet valve for air of any suitable form shown in the present instance as a stationary grid or grating and a rotatable one adapted to cover or uncover by its rotation, the apertures of the grating. 4 is a fire-box or combustion chamber beneath the boiler 5 extending to any desirable length, shown in the present instance as the full length. 6 and 7 are series of valved inlets from the exterior into the chamber 4 and extending preferably the whole length of the chamber. These inlets are supplied with controlling devices or valves of any suitable form shown in the drawings as rotatable plates preferably as described for valve 3 and they are arranged in any suitable manner or

as necessitated by the conditions under which the fuel is used. 8 is a damper of any suitable form and located in any suitable place to regulate the draft or the travel of the gases beneath the boiler.

In operation the action of this arrangement is as follows:—Only sufficient steam is used to vaporize or atomize the liquid fuel and the valve 3 is opened less than sufficiently to admit enough air to sustain combustion. The units of the series of valves 6 and 7 including valve 3 are opened as the condition of combustion requires, admitting only enough air to each separate location as the necessities of that location demand. These valves thus effect a progressive combustion of the fuel. The opening of the damper more or less determines the aggregate flow of the inflaming gases at such speed that complete combustion is accomplished at the desired point. It is seen by this arrangement that there is the reverse of the blow pipe action heretofore employed and in place thereof is a slowly moving current of inflammable gas filling the whole space of the furnace chamber analogous to the atmosphere in which a gas flame burns. This chamber is supplied at various points along its whole length with oxygen bearing air which ignites in the vicinity of the various valved apertures which admits it analogous to the coal gas flame burning in a room. In cases in which gaseous fuel is employed instead of vaporized liquid, the steam jet would not be necessary.

It is of course obvious that forced draft in any of the ordinary forms involving pressure or induction may be employed by connecting the valve apertures with a source of pressure or otherwise connecting the chamber with a forced draft producing apparatus. As these are within the knowledge of the ordinary mechanic, it is not necessary to burden the present disclosure with a description thereof.

Inasmuch as the present invention is a radical departure from previous types of fluid burning devices, many changes may be made in the arrangement, construction and proportion of the various parts. In fact such changes must be made to adapt it to its various applications, such as stationary, marine, locomotive and other types of boilers and stoves, furnaces and kilns etc., without departing from the essential character of the invention. I therefore do not desire to confine myself to the form, proportion or the arrangements of the parts herein shown, which merely illustrate a good and simple application of the invention for the type of boiler to which it is applied in this illustration of the invention.

What I claim is:—

1. In a fluid fuel furnace for the purpose set forth, the combination of a combustion chamber formed to constitute a continuous, completely free passage for the gaseous fuel therethrough, a fuel feeding device to introduce fluid fuel at one end of the combustion chamber of the furnace consisting of a controllable conduit for liquid fuel and a controllable conduit for gaseous fluid under pressure, the exhausts of both of said conduits being adjacent, whereby the liquid is atomized, and a damper to regulate the flow of the inflaming gases through the combustion chamber, the bottom wall and side walls of the furnace being each provided with a series of valve controlled air inlet passages arranged at regular intervals whereby a regular and progressive combustion of fluid fuel throughout the entire combustion chamber is effected, combustion being initiated and sustained only at predetermined points along the combustion chamber.

2. In a fluid fuel furnace, the combination of a combustion chamber having a substantially flat horizontal bottom wall and substantially flat vertical side walls to form a continuous, completely free passageway for the gaseous fuel throughout the entire combustion chamber of the furnace, a fuel feeding device to introduce fluid fuel at one end of the combustion chamber of the furnace consisting of a controllable conduit for liquid fuel and a controllable conduit for gaseous fluid under pressure, the exhausts of both of said conduits being adjacent whereby the liquid is atomized, said bottom wall and side walls of the furnace being provided with a series of valve controlled air inlet passages arranged at regular intervals, the air inlet passages of the side walls being arranged at directly opposite points along said walls and the air inlet passages of the bottom walls being arranged alternately with respect to the air inlet passages of the side walls, whereby a regular and progressive combustion of fluid fuel throughout the entire combustion chamber is effected and combustion is initiated and sustained only at predetermined points along the combustion chamber.

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