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LIQUID-FUEL ATOMIZER AND INDUCED-DRAFT APPARATUS.

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To all whom it may concern:

Be it known that I, WILLIAM R. GULICK, a citizen of the United States, and a resident of Jersey City, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Liquid-Fuel Atomizers and Induced-Draft Apparatus, of which the following is a specification.

One important object of the invention is to provide a novel apparatus adapted for use in connection with furnaces of the fire boxes of steam boilers, and designed to operate through the fire box door and above the coal to produce an induced draft through the fire, at the same time igniting the coal from the top, and heating the walls of the fire box above the coal in order to create a more rapid generation of steam than could be accomplished were the fire in the fire box and the usual draft solely relied upon.

In many instances, especially in the case of ships on the sea, it is necessary to get up steam in the engine boilers on short notice and in the greatest haste in order to make a quick departure, and when the fires have been banked for any considerable time, as when a ship is in port, it requires a large amount of time and labor to break the fires and produce the necessary steam pressure. To enhance the generation of steam and combustion of the coal in the fire boxes in such cases where a large steam pressure is required on short notice and in the greatest haste, the present invention contemplates the use of a liquid fuel atomizer which can be inserted into a fire box through the fire box door, and above the coal, the heat and flame therefrom being directed against the boiler walls, to rapidly heat the water in the boiler, the burning of the liquid fuel and the heat therefrom producing an induced draft through the coal and at the same time igniting the coal from the top, thus eliminating the necessity of waiting for the usual draft to penetrate the fire from the grate to burn the coal in the usual manner.

Another important object of the invention is to provide a portable liquid fuel atomizer of the character described which can be easily and quickly transported so that the same can be normally stored in an out-of-the-way place, and carried to the fire to be operated upon only when required for actual use.

Further objects of the invention are to provide an atomizer whereby the fuel is thoroughly atomized and whereby the spray from the atomizer can be directed into the fire box from any angle at will, thus enabling the extreme front, sides, and rear of the fire box to be heated as well as the center thereof, and to provide a novel combination of the fuel tank and atomizer whereby the two may be transported together, yet allowing the atomizer itself to be swung bodily away from the fire box door to allow the throwing in of coal without moving the fuel tank.

With these and other objects in view which will more fully appear as the description proceeds and the nature of the invention is better understood, the invention consists in certain novel constructions, combination and arrangement of the parts as will be more fully pointed out in the following description and appended claims.

For a full understanding of the invention reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a fragmentary front elevation of the fire box of a conventional steam boiler, showing a liquid fuel atomizer constructed in accordance with the invention in operative position relative thereto.

Figure 2 is a fragmentary horizontal sectional view through the fire box, the atomizer appearing in top plan view, and the various adjusted positions thereof being shown in dotted and dot and dash lines.

Figure 3 is a side elevation of the fire box and liquid fuel atomizer, portions of the fire box being broken away and shown in section; and

Figure 4 is an enlarged longitudinal sectional view through the atomizer head.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Specifically describing the present embodiment of the invention the reference character A designates the fire box of a conventional steam boiler, said fire box being provided with the usual door opening.
which is adapted to be normally closed by a door. The liquid fuel atomizer embodying the present invention when in operative position is adapted to be inserted into the door opening and the spray therefrom directed upon the walls of the fire box, or the coal in the fire box if it is desired to rapidly ignite the coal from the top.

The atomizer and fuel tank may be so combined as to be transported as a unit, or the atomizer may be constructed to be interchangeably connected to any one of several fuel tanks. However, both the fuel tank and atomizer are constructed to be portable so that they can be moved from one fire box to another and stored in an out-of-the-way place when not in use. The fuel tank is designated by the reference numeral 1, and is provided at its top with an air pipe connection 2, which is adapted to be connected to any suitable air supply, such as the fan blower 3. A fuel discharge pipe 4 extends downward through the fuel tank 1 to a point slightly spaced from the bottom thereof and projects upwardly above the top of the tank, the upper end thereof having a swivel connection member 5 adapted to receive one end of a fuel supply pipe 6, the other end of which is provided with a second swivel connection member 7 connected to one arm of an elbow 8, the other arm of which carries a third swivel connection member 9 adapted to be connected to the atomizer head B. A fuel supply regulating valve 10 is arranged in the fuel supply pipe 6 to regulate the supply of fuel to the atomizer B. The tank 1 is comparatively small in size and when in use is adapted to be placed in a convenient position adjacent the fire box to be operated upon by the berber.

The atomizer head B comprises a hollow substantially T-shaped casing or body member 11, the two arms 12 and 13 being in substantially alignment with each other, while the other arm 14 is arranged at right angles to the other two arms. The passage between the two aligned arms 12 and 13 is enlarged to provide an annular fuel mixing chamber 15. The arm 14 is threaded to receive a nipple 16, the outer end of which is adapted to be connected to the swivel connection member 5, while the inner end thereof is provided with a fuel supply nozzle 18, which is provided with a restricted passage 19 and projects upwardly into the mixing chamber 15 to a point slightly below the axial center thereof. The arm 11* of the casing 11 is reduced and threaded to receive one end of an air regulating valve 16, the other end of which is connected in any suitable manner to a flexible compressed air supply hose to be provided with a cut-off valve 17.

The intake end of the valve 16 carries an air nozzle 20 which has a restricted passage 21. The exhaust end of the valve 16 extends through the valve 15, the said nozzle extending into the mixing chamber 15 along the axial center thereof to a point slightly spaced from the fuel nozzle 18. The fuel nozzle 14 and air nozzle 16 are thus at substantially right angles with each other and the jets therefrom meet in the said point. This causes the jets to tend to deflect each other and the result is the thorough atomization or breaking up of the liquid fuel into vapor. The arm 11* of the body member 11 is provided with an elongated fuel mixture discharge nozzle 19 from which the fuel mixture is projected.

In the operation of the device the fuel tank 1 is brought into a position adjacent the furnace or steam boiler to be operated upon and the air pipe 2 connected to the compressed air supply. The fuel supply pipe 6 is connected by the swivel 5 to the fuel discharge pipe 4 in the tank and the valve 10 opened. The compressed air acting on the surface of the fuel in the tank 1 forces the fuel through the pipe 6 and out of the fuel nozzle 14 in the atomizer B under pressure. The air cut-off valve 17 in the compressed air hose is opened and the air regulating valve 15 on the atomizer head B manipulated to the proper degree to allow the compressed air to discharge from the air nozzle 16. The jets of air and fuel thus meet under pressure and the fuel is broken up into vapor and thoroughly mixed with the air in the mixing chamber 15, after which the current of air forces the fuel mixture into the nozzle 19, and then into the fire box. The effect of this operation is to spray liquid fuel by means of the atomizer into the fire box under pressure, the liquid fuel mixture being ignited and burned in the fire box above the coal. It will, of course, be obvious that the fuel mixture may be ignited from the fire in the fire box, or in any other suitable manner. The heat thus generated plays upon the walls of the fire box to heat the same to immediately produce steam, and the escape of the burned gases through the fire box passes an induced draft through the fire. In other words, the hot gases generated by the liquid fuel draw air up through the fire box from the pit by suction in addition to the usual natural draft, and the combustion of the coal is greatly enhanced. This induced draft is increased by the compressed air entering the fire box from the liquid fuel atomizer which acts in cooperation with hot gases and which, owing to its being partially burned with the liquid fuel, is also heated so that it has the combined effect of both a hot gas and a gas under pressure in inducing a draft up through the coal. Further, the heat from the burning liquid fuel will aid in igniting the coal from the top, thus further increasing the combustion thereof, and if im-
mediate ignition of the coal is desired the spray from the liquid fuel atomizer can be caused to play directly upon the coal. The spray can be directed upon the fire box walls at all points by means of the swivel connections 7 and 9, the swivel 7 allowing the atomizer head B to be swung in a vertical plane up and down, as indicated by dotted lines on Fig. 3, so as to direct the spray to either the extreme front or rear of the fire box, while the swivel 9 allows the burner head B to be swung in a horizontal plane so as to direct the spray toward the sides and corners of the fire box, as indicated by dotted and dot and dash lines on Fig. 2. Further, it will be noted that the atomizer head B and fuel supply pipe 6 can be swung bodily away from the fire box into an out-of-the-way position by means of the swivel 5, to allow the throwing in of new coal, as indicated by dotted and dot and dash lines \( x \) and \( y \), respectively, on Fig. 2. The fuel tank 1 thus serves as a support for the atomizer, and the fuel supply pipe 6 serves as a bracket arm for the atomizer, both the tank and atomizer B being portable either as a unit or separately so that the device can be utilized in connection with any of several fire boxes when it is desired to induce an unusually rapid generation of steam in the boiler and combustion of the coal in the fire box, the swivel connections allowing the atomizer to be manipulated so as to effectively direct the flame upon all the walls of the fire box and also upon the entire surface of coal from the fire box door. Further, the entire device can be quickly disassembled to occupy a minimum amount of space by detaching the atomizer head B from the fuel supply pipe 6, and detaching the pipe 6 from tank 1.

While I have shown and described only one liquid fuel atomizer and tank it will be obvious that it is within the scope of the invention to combine a plurality of atomizers with a common fuel supply pipe so that a battery of two or more fire boxes could be operated upon simultaneously.

What I claim is:

1. A liquid fuel atomizer, including a fuel supply tank, a fuel supply pipe having a swivel connection with said tank to swing in a horizontal plane, an elbow arranged at the outer end of said supply pipe, one arm thereof having a swivel connection with the pipe to swing in a vertical plane, and a liquid fuel atomizer having a swivel connection with the other arm of said elbow to swing in a horizontal plane.

2. An apparatus of the class described, comprising a liquid fuel supply tank, a vertical pipe section extending through the top of said tank and depending within the tank to a point adjacent the bottom thereof, a horizontally swinging pipe section having a swivel connection at one end with the upper end of the vertical pipe section, an elbow having a swivel connection with the free end of said horizontal pipe section, an atomizer having a swivel connection with the free arm of said elbow and having a fuel jet communicating with the elbow and an independent air jet, a flexible air-supply hose communicating with the air jet of the atomizer, and means for supplying air under pressure to the surface of the fuel in said tank.

3. The combination with a portable liquid fuel tank, of a pipe section communicating with the interior of said tank and connected therewith to swing relatively to the tank, an elbow pipe section having one end swiveled to the free end of said swinging pipe section, an atomizer swiveled on the other end of said elbow section and having a fuel jet communicating with said elbow and an air jet, and a flexible air-supply conduit communicating with said air jet.

This specification signed this fifth day of March, A. D. 1918.

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