W. A. AND J. A. DOBLE.

FUEL CONTROL SYSTEM FOR BOILERS.

APPLICATION FILED MAR. 2, 1917.

1,359,042.

Patented Nov. 16, 1920.

2 SHEETS—SHEET 1.

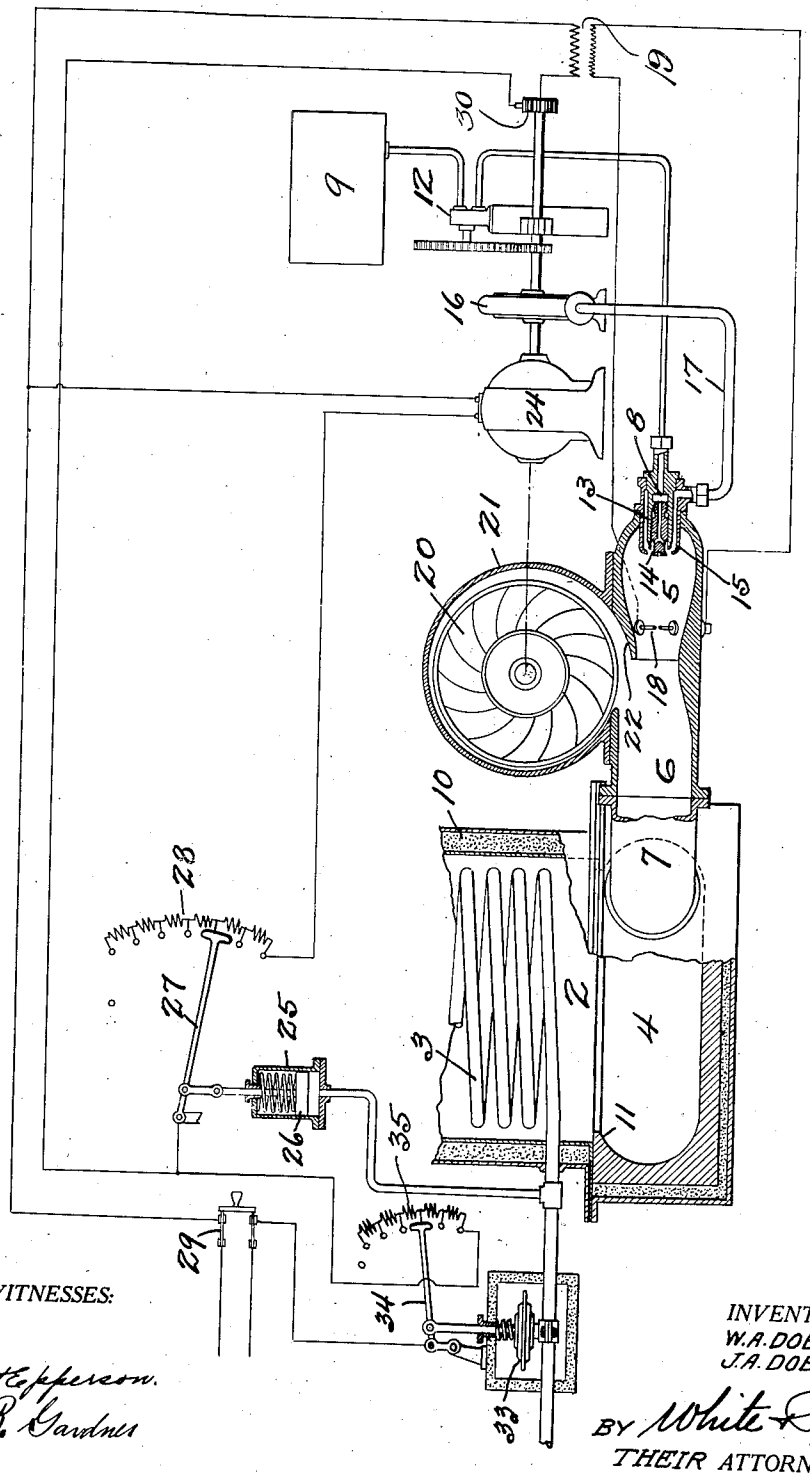


Fig. 1.

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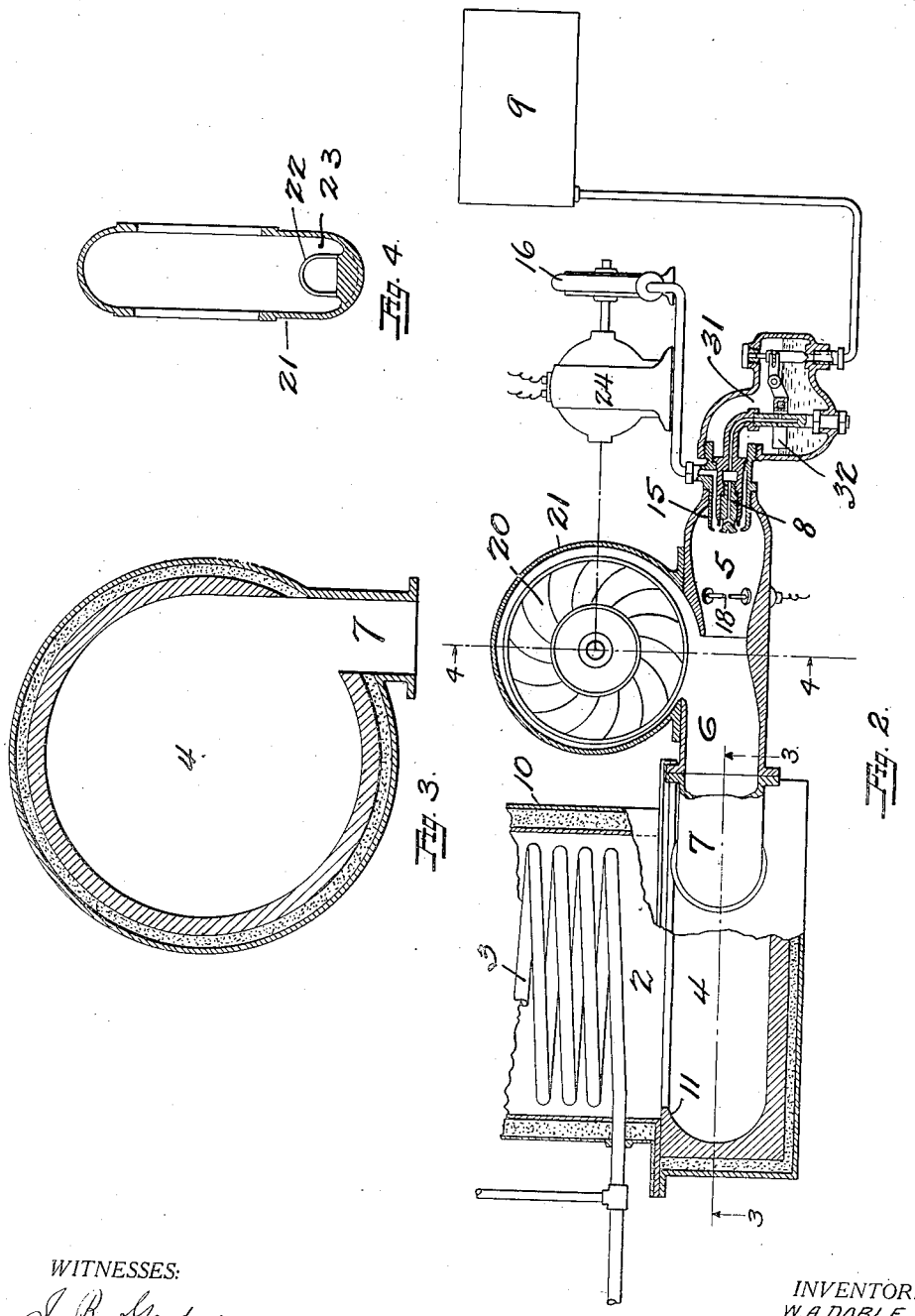


Fig. 4.

Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM A. DOBLE AND JOHN A. DOBLE, OF SAN FRANCISCO, CALIFORNIA, ASSIGNORS TO DOBLE LABORATORIES, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

FUEL-CONTROL SYSTEM FOR BOILERS.

1,359,042. Specification of Letters Patent. Patented Nov. 16, 1920.

Application filed March 2, 1917. Serial No. 151,928.

To all whom it may concern:

Be it known that we, WILLIAM A. DOBLE and JOHN A. DOBLE, citizens of the United States, and residents of the city and county of San Francisco, State of California, have invented a certain new and useful Fuel-Control System for Boilers, of which the following is a specification.

The invention relates to apparatus for supplying and controlling the supply of gaseous or liquid fuel to a burner and particularly to fuel control systems for automobile boilers, water heaters, house heaters or other devices containing or through which a heat absorbing medium passes.

An object of the invention is to provide an apparatus which is economical in the use of fuel and which produces a clean fire.

Another object of the invention is to provide an apparatus which varies the supply of fuel in accordance with varying thermal conditions within the device being heated.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description, where we shall outline in full that form of the invention which we have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings we have shown one specific form of our generic invention, but it is to be understood that we do not limit ourselves to such form, since the invention, as expressed in the claims, may be embodied in a plurality of forms.

Referring to said drawings:

Figure 1 is a diagrammatic representation of an apparatus embodying our invention, applied to a steam generator.

Fig. 2 is a diagrammatic representation of modified form of the apparatus.

Fig. 3 is a horizontal section of the fire box taken on the line 3–3, Fig. 2.

Fig. 4 is a cross section of the mixing chamber and blower chamber on the line 4–4, Fig. 2, the blower being omitted.

The apparatus is adapted for use in connection with devices containing heat absorbing mediums, such as steam generators and water or air heaters, and in this application we shall describe its use in connection with steam generators for steam propelled vehicles, such as automobiles and trucks, for which it possesses several advantages. The steam generator 2 may be of any desired form, preferably of the coil or flash type, the coil 3 being inclosed in a suitable heat insulated casing 10 which is mounted on and connected to the fire box or combustion chamber 4. The fire box, which is preferably circular in shape, is preferably lined with refractory fire brick, which, when heated, assists in causing complete combustion of the fuel, and is preferably provided at its upper end with an overhanging wall 11 which holds the flame in the fire box until combustion is complete. Means are provided for blowing an ignited mixture of fuel and air into the fire box and this means enters the fire box tangentially so that a swirling fire is produced in the fire box, which is held down to some extent by the overhanging wall, thereby causing an equal distribution of the heat to steam generator tubes or heat-absorbing medium. This means comprises a casing including a fuel atomizing and ignition chamber 5 and an air mixing chamber 6, which is connected to the fire box by the neck or conduit 7. The system is applicable to liquid or gaseous fuels, but in the following description we shall describe its construction and operation when using liquid fuel. The fuel atomizing chamber 5 is provided with a liquid fuel nozzle 8, which is supplied with fuel under pressure, such as kerosene or distillate, or heavier hydrocarbon fuel, from the supply tank 9 by means of the pump 12, which is preferably of the gear type or other positive feed type. The fuel nozzle comprises a shell 13 into which the nipple 14 is screwed, the nipple being provided with a fuel passage opening on the side therein within the shell and adjacent the end thereof. The nipple is narrowed adjacent its outer end to form an annular chamber within the shell, and a head on the nipple, forms with the end of the shell, an annular nozzle, the area of which is adjustable by screwing the nipple in the shell. Surrounding the shell and spaced therefrom whereby an annular chamber is formed, is a sleeve 15 which terminates in an inturned lip adjacent the end of the shell, and forms an annular nozzle surrounding the fuel nozzle and in atomizing relation therewith. Air under pressure is forced by the high pressure blower 16, through the pipe 17 and into the sleeve, whence it discharges, blowing the fuel into a spray. Arranged in the

path of the fuel spray produced by the air and fuel nozzles is an electric ignition device 18 comprising two insulated electrodes connected to the terminals of a transformer or induction coil 19 having a make and break device such as the motor driven commutator 30 in the primary circuit. A spark between the electrodes ignites the fuel spray. Supplementary air is supplied to the resulting flame to complete combustion at a point in front of the ignition device, so that the spray is not diluted until after it is ignited. The supplementary air is supplied to the mixing chamber 6 by the low pressure blower 20 which is preferably arranged immediately adjacent the mixing chamber. In the present construction we have shown the blower housing 21 secured directly to the mixing chamber housing and the blower is arranged to blow air into the mixing chamber in the direction of the inlet neck 7. Means are provided for causing the supplementary air supplied by the blower to contact with the flame on all sides without materially distorting the flame or blowing it toward one side of the mixing chamber. The outlet of the spraying and ignition chamber is constricted somewhat by a hood 22, which divides the blower chamber from the ignition chamber and directs the air in a smooth curve into the mixing chamber. The hood is spaced from the wall of the mixing chamber at the top and sides and forms a horse shoe shaped passage 23 through which the air is blown into the mixing chamber. The ignited spray issues from under the hood and the auxiliary air contacts with the flame on all sides, thereby producing complete combustion without materially distorting the flame. The flame is blown through the neck 7 into the fire box where the heat thereof is equally distributed to the steam generating coils.

Means are provided for synchronously driving the low pressure blower 20, the high pressure blower 16 and the fuel pump 12, so that the speeds of these three devices always correspond and so that the relative proportions of fuel and air remain constant and the consistency or quality of the flame always remains the same, regardless of its size. In the present construction the two blowers and the fuel pump are driven by the motor 24, which is furnished with current from a suitable source of supply, such as a storage battery carried on the automobile, and fed by a generator connected to the engine.

Means are provided for varying the speed of the blowers and pump in accordance with variations in steam pressure in the boiler. Connected to a boiler tube is a cylinder 25 having a spring-loaded piston 26 therein, which is connected to the rheostat arm 27. The rheostat 28 is in the motor circuit and is so arranged that a movement of the rheostat arm due to an increase in steam pressure in the boiler, produces a reduction in the speed of the motor, and vice versa. A switch 29 in the battery circuit serves to start or stop the motor when desired. When it is desired to generate steam in the boiler, the switch 29 is closed, thereby throwing the blowers, fuel pump and ignition device into operation and producing an efficient flame in the fire box. Means are also provided for controlling the driving means which is operative by variations in temperature of the heat-absorbing medium. Arranged in thermal communication with the heat-absorbing medium is a thermostat 33 which is connected to the rheostat arm 34 of the rheostat 35. The rheostat 35 is connected in series with the rheostat 28 and operates in the same manner to vary the speed of the motor.

In Fig. 2 we have shown a modified form of construction which is similar in all respects to that shown in Fig. 1, with the exception that the fuel feed pump is dispensed with and the flow of fuel to the fuel nozzle is controlled by a float. In this construction, the fuel nozzle 8 extends into a chamber 31 arranged below the atomizing chamber and the inflow of fuel to the chamber 31 is controlled by a float 32 which functions to maintain the level of the fuel in the chamber substantially constant. The amount of oil drawn from the nozzle and projected in the spray is controlled by the speed of the high pressure blower.

Subject matter disclosed but not claimed in this application is claimed in applicants' copending application, Serial No. 151,927, filed simultaneously herewith, and it is to be understood that such subject matter is not disclaimed, abandoned or dedicated to the public.

We claim:

1. The combination with means adapted to receive a heat-absorbing medium, of a fuel mixing device associated therewith, means for feeding fuel to said device, means for feeding air to said device for atomizing said fuel, means for igniting said atomized fuel, means for feeding air to said ignited fuel, and means for synchronously driving said fuel feeding means and both of said air feeding means.

2. The combination with means adapted to receive a heat-absorbing medium, of a fuel mixing device associated therewith, means for producing a spray of air and fuel in said device, means for igniting said spray, means for adding air to the ignited spray, means for driving said spray-producing means and said air adding means, and means responsive to changes in conditions in the heat absorbing medium for controlling said driving means.

3. The combination with means adapted to receive a heat-absorbing medium, of a fuel mixing device associated therewith, a fuel nozzle in said device, a pump for controlling the flow of fuel to said nozzle, an air nozzle arranged in atomizing relation with said fuel nozzle, a blower for forcing air through said air nozzle whereby a fuel spray is produced, means for igniting said spray, a blower arranged to add air to said ignited spray, and means for synchronously driving said pump and blowers.

4. The combination with means adapted to receive a heat-absorbing medium, of a fuel mixing device associated therewith, a fuel nozzle in said device, a pump for controlling the flow of fuel to said nozzle, an air nozzle arranged in atomizing relation with said fuel nozzle, a blower for forcing air through said air nozzle whereby a fuel spray is produced, means for igniting said spray, a blower arranged to add air to said ignited spray, means for synchronously driving said pump and blowers, and means responsive to changes in conditions in the heat-absorbing medium for controlling said driving means.

5. The combination with means adapted to receive a heat-absorbing medium, of a fuel mixing and igniting device associated therewith, said device comprising a fuel spraying and igniting chamber, a mixing chamber into which the resultant flame extends, a blower arranged adjacent the mixing chamber, and arranged to discharge all of the air blown into the flame in said chamber and a deflecting hood arranged between the blower and the spraying and igniting chamber.

6. The combination with means adapted to receive a heat-absorbing medium, of a fuel mixing device associated therewith, means for feeding fuel to said device, means for feeding air to said device for atomizing said fuel, means for feeding auxiliary air to said fuel spray, and means for synchronously driving said fuel feeding means and both of said air feeding means.

In testimony whereof we have hereunto set our hands at San Francisco, California, this 21st day of February, 1917.

WILLIAM A. DOBLE.
JOHN A. DOBLE.

In presence of—
H. G. PROST.