

W. A. DOBLE.
FUEL BURNER.
APPLICATION FILED APR. 28, 1917.

1,273,466.

Patented July 23, 1918.

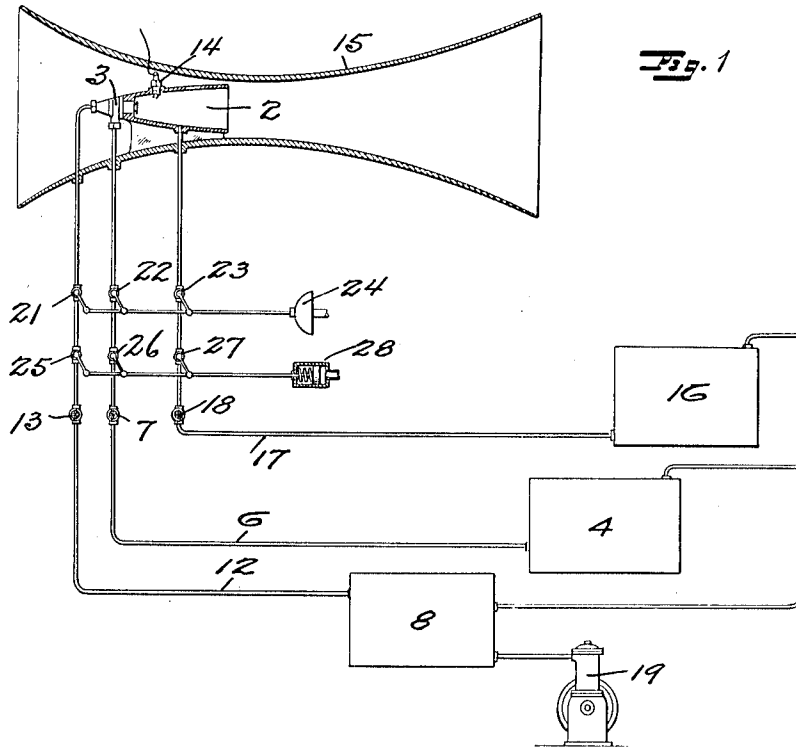


Fig. 2

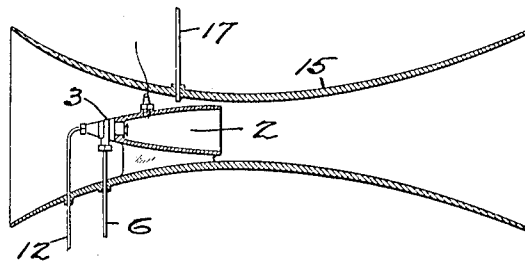
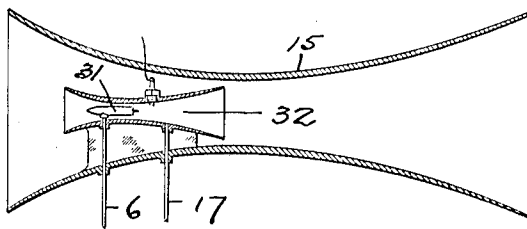


Fig. 3



WITNESS

J. B. Gardner

INVENTOR
W. A. DOBLE

BY *White & Post*

HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM A. DOBLE, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO DOBLE LABORATORIES, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

FUEL-BURNER.

1,273,466.

Specification of Letters Patent.

Patented July 23, 1918.

Application filed April 28, 1917. Serial No. 165,152.

To all whom it may concern:

Be it known that I, WILLIAM A. DOBLE, a citizen of the United States, and a resident of the city and county of San Francisco, State of California, have invented a certain new and useful Fuel-Burner, of which the following is a specification.

The invention relates to fuel burners and particularly to liquid or gaseous fuel burners.

An object of the invention is to provide a method of burning very heavy liquid fuels.

Another object of the invention is to provide a method of burning heavy liquid fuels whereby gases of combustion of high velocity are produced.

Another object of the invention is to provide a fuel burner in which the kinetic energy of the burning fuel induces sufficient air into the burner to complete combustion of the heavy fuel.

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

Referring to the drawings:

Figure 1 is a longitudinal section of one form of burner of my invention shown somewhat diagrammatically and associated fuel and air containers and conductors.

Fig. 2 is a similar view of a slightly modified form of burner.

Fig. 3 is a similar view of another modified form of burner.

The burner of my invention may be employed for the production of power in engines and turbines and for heating and for other useful purposes and it is to be understood that I do not limit myself to any particular use of the burner. In the burner of my invention I produce initial ignition of a mixture of fuel and insufficient air to produce complete combustion and cause the velocity or kinetic energy of the flame so produced to induce sufficient air into the

burner to complete combustion. I also employ the heat of combustion to volatilize or break up heavy hydrocarbon fuel such as crude oil and the expansion of this crude oil vapor or gas further increases the velocity of the gases resulting in the induction of sufficient air to produce complete combustion of all of the fuel. The high velocity gases can be effectively utilized in steam generators and other heating devices which cannot readily be provided with stacks or other draft producing means and can be utilized to produce power by being directly introduced to the blades of a turbine, constructed on the general principle of steam turbines.

The burner comprises a cup or shell 2, preferably elongated in form, in the end of which is arranged the combined air and fuel nozzle 3. Fuel under pressure and preferably liquid fuel, such as kerosene or distillate, from a suitable source, such as the tank 4, is introduced into the nozzle 3, through the pipe 6, which is provided with a manually operated valve 7. Air under pressure, from a suitable source, such as the tank 8, is introduced into the nozzle through the pipe 12 which is provided with a manually operated valve 13. The nozzle is so constructed and arranged that the fuel spray produced thereby is directed toward the open end of the shell 2. Arranged in the shell, in front of the nozzle is a spark plug 14 or other ignition device for igniting the spray. The air in the spray mixture is preferably only that which it has been necessary to employ to spray the fuel and is insufficient to complete combustion, but is sufficient to allow the mixture to become ignited. The burning of the mixture greatly increases its volume, so that the burning mixture is expelled from the shell at high velocity.

The combustion of the mixture heats the shell to a high temperature and I have found that heavy oils, such as crude oil, may be advantageously used and completely burned, by flowing the oil into the hot shell where it is quickly volatilized or gasified. The heavy oil may be flowed onto the inner surface of the shell, as shown in Fig. 1, or may be flowed onto the outer surface, as shown in Fig. 2. When flowed onto the inner surface, the great increase in volume of the oil due to its volatilization and gasification,

greatly increases the velocity or kinetic energy of the gases discharging from the shell and consequently increases the amount of air which is induced into the burner, the amount of air induced being sufficient to produce complete combustion of both the light and heavy oils.

Surrounding the shell 2 and supporting it is a tube 15, preferably a Venturi tube having a flaring outlet and having its narrow portion adjacent the discharge end of the shell 2. The kinetic energy of the high velocity gases discharging from the shell into the Venturi tube causes air to be drawn into the tube and past the end of the shell and to mix with the burning mixture, thereby producing complete combustion and greatly increasing the velocity of the gases. For a given sized opening between the shell and the venturi, the amount of air drawn will vary with the amount of fuel discharged and the opening is preferably made of such size that the amount of air drawn in is that which is required for complete combustion of the fuel, although for turbine use, a greater amount of air may be introduced. From the end of the shell, the Venturi tube flares out into the steam generator or other apparatus. When used in connection with a heat-absorbing medium containing apparatus, the venturi is short, so that the mixture is burned within the apparatus, but when used in connection with a turbine, the flaring mouthed tube is preferably of such length that combustion is complete before the gases contact with the turbine blades. The expansion of the gases in the flaring mouth increases their velocity, so that they enter the turbine runner at high velocity.

The heavy liquid fuel is conveyed to the surface of the shell 2 from the pressure storage tank 16 through the pipe 17 which is provided with a manually operated valve 18. In starting the burner, the valve 18 is not opened until the shell becomes sufficiently hot to break up the heavy oil. When the burner is employed to generate steam for operating an engine, the pressure air and the pressure on the fuel is preferably produced by a pump 19, connected to the engine, but when the burner is employed for other uses, the pressure may be produced in any desirable manner.

In Fig. 2, the pipe 17 discharges the heavy fuel onto the outer surface of the shell 2, where it is broken up and its products are drawn into the burner with the air, and the combustion of its products greatly increases the velocity of the gases in the Venturi tube which results in inducing sufficient air to complete combustion.

Means are provided for varying the flow of air and fuel to the nozzle and the flow of the heavy fuel to the burner in accordance with variations in conditions in the ap-

paratus to which the burner is applied. When applied to a steam generating apparatus, the control means are arranged to vary the flow of air and fuels in accordance with variations in temperature and pressure within the steam generating unit. Arranged in the pipes 12, 6 and 17 respectively are valves 21, 22 and 23 which are connected to a thermostatic control device 24 which is operated by variations in temperature in the steam generating unit, so that the amount of air and fuels fed to the burner varies inversely with the steam temperature. The pipes 12, 6 and 17 are also provided respectively with valves 25, 26 and 27 which are connected to a pressure operated device 28 connected to the steam generator, so that the flow through the pipes is varied inversely as the pressure.

In Fig. 3 I have shown a modification in which the air under pressure is eliminated and the fuel spray produced by the pressure of the fuel. The light fuel spray nozzle 31, to which the fuel is fed under pressure, is arranged in the Venturi tube 32, which is supported within the Venturi tube 15. The nozzle discharge end is arranged at the narrow portion of the venturi 32 and is constructed to discharge a spray of fuel in the direction of the length of the venturi 32. The spray and the partial combustion of the fuel in the venturi 32 induce sufficient air to support such combustion and the tube 32 is heated. The heavy fuel is introduced onto the surface of the hot tube 32 where it is broken up, its products increasing the volume of the gases and increasing the kinetic energy of the gas. The kinetic energy of the gases or of the burning mixture induces a sufficient supply of air through the venturi 15 to complete combustion.

I claim:

1. The method of burning liquid fuel which consists in producing a continuous spray of light liquid fuel and air, igniting said spray to produce a high velocity flame, employing heat from said flame to volatilize a heavy hydrocarbon, the products of which mix with said flame and increase the velocity of the flame, and causing the kinetic energy of the mixture to induce sufficient air into the flame to complete combustion and further increase the velocity of the gases of combustion.

2. A liquid fuel burner comprising means for projecting a spray of light liquid fuel, means for igniting the spray, means for introducing heavy hydrocarbon fuel into thermal communication with the resultant flame whereby the heavy fuel is vaporized and mixed with the ignited spray, and means for causing the resultant mixture to induce a supply of air into the flame.

3. A fuel burner comprising a tube, means in the tube for producing a mixture of air and fuel, means for igniting the fuel,

means for introducing heavy hydrocarbon fuel into the tube in thermal contact with the flame and means for adding air to the mixture thus produced.

5 4. A fuel burner comprising a chamber having an open end, means for projecting a spray of fuel and air in the chamber toward the open end thereof, means for igniting the mixture within the chamber, a conduit
10 for flowing heavy hydrocarbon onto the hot surface of said chamber and a tube surrounding the discharge end of the chamber and spaced therefrom.

5 5. A fuel burner comprising a tube, means in the tube for producing an ignited combustible mixture projected in the direction of the axis of the tube and means for
15 introducing heavy liquid hydrocarbon fuel into the tube in thermal contact with the
20 ignited mixture.

6. A fuel burner comprising a tube, an

air and fuel nozzle arranged within the tube, conduits for supplying fuel and air under pressure to said nozzle, means in the tube for igniting the resultant spray, and
25 a conduit for introducing heavy liquid hydrocarbon into the tube and in thermal contact with the ignited spray.

7. A fuel burner comprising a chamber having an open end, an air and fuel nozzle
30 arranged in said chamber, conduits for conducting fuel and air under pressure to said nozzle, means in the chamber for igniting the spray produced by the nozzle, a conduit for flowing heavy hydrocarbon fuel
35 onto the surface of said chamber and an open ended tube surrounding and spaced from said chamber.

In testimony whereof I have hereunto set my hand at San Francisco, California, this
40 23d day of April, 1917.

WILLIAM A. DOBLE.