

July 10, 1928.

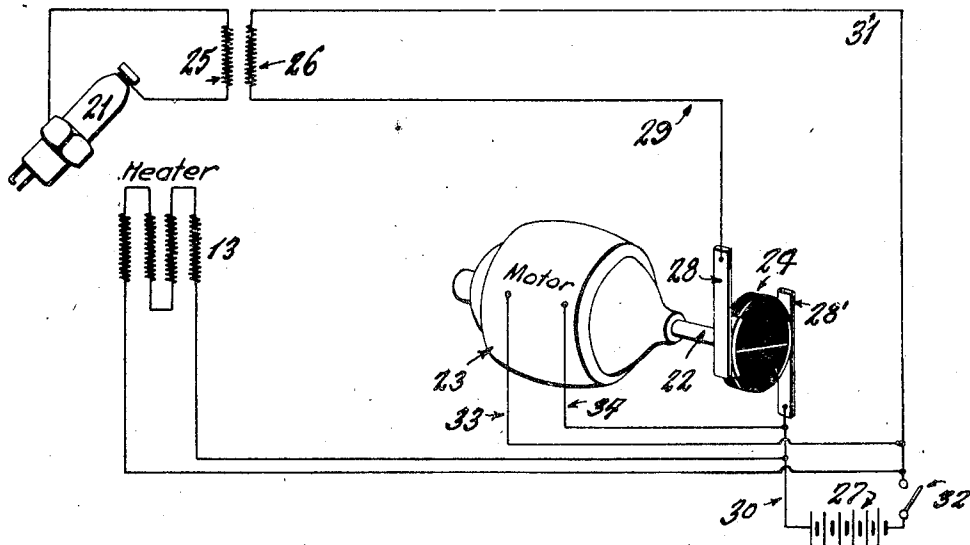
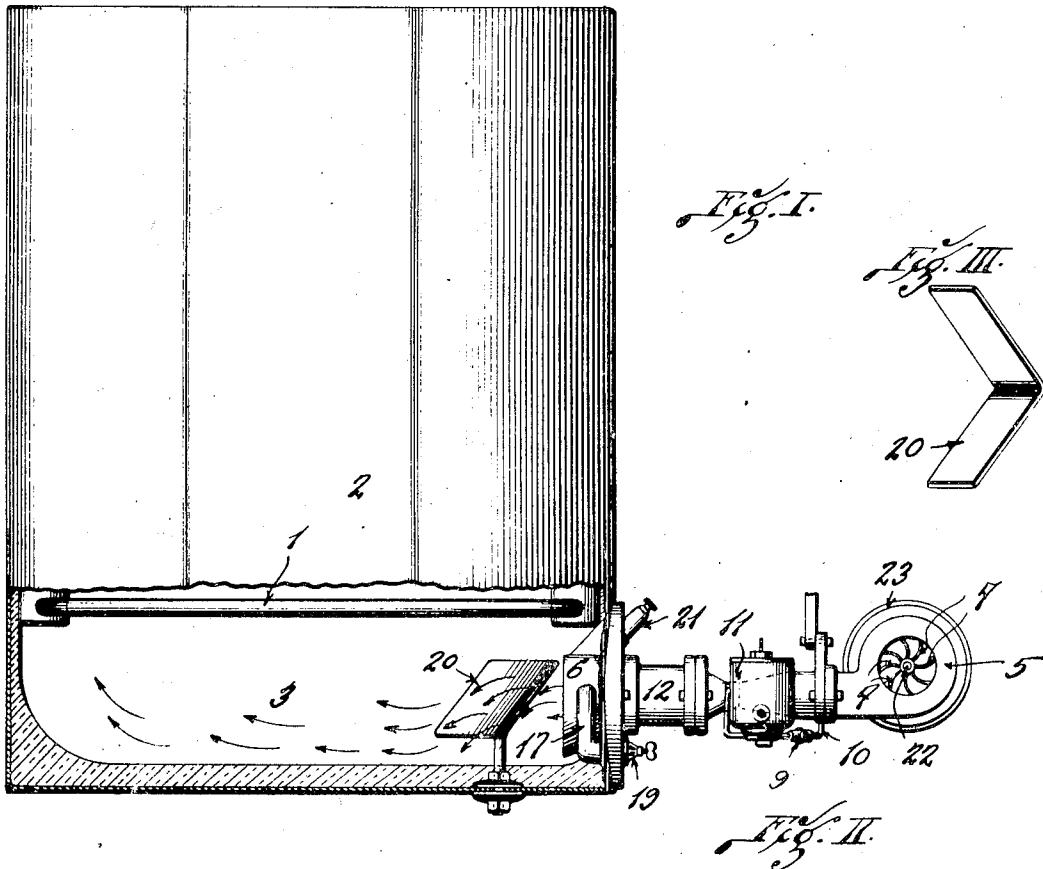
G. F. MOORS

1,676,501

BURNER

Filed Nov. 26, 1919

3 Sheets-Sheet 1



Inventor -

Geo. F. Moors

by *Knight & Clark* Attys.

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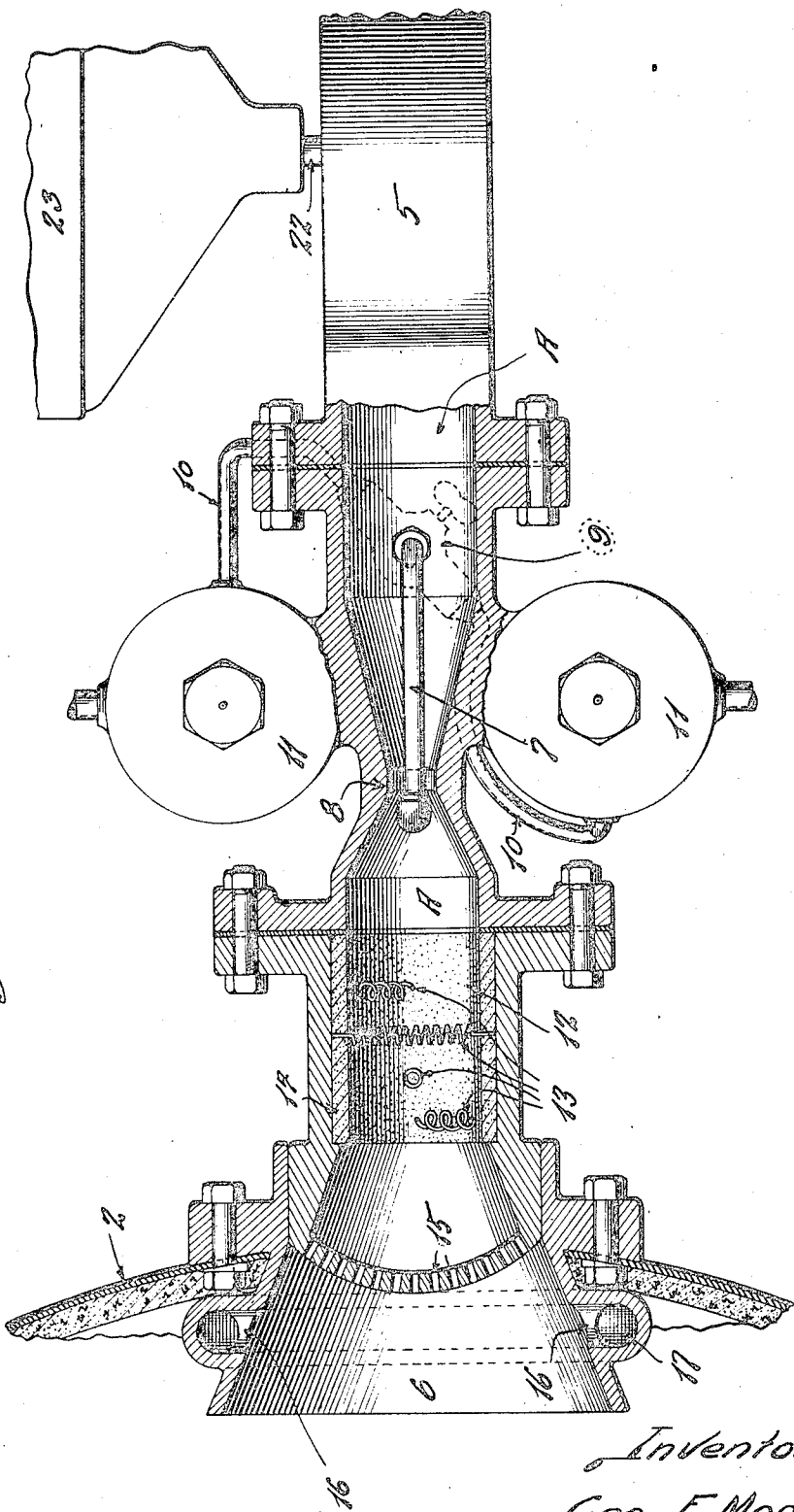
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3 Sheets-Sheet 2



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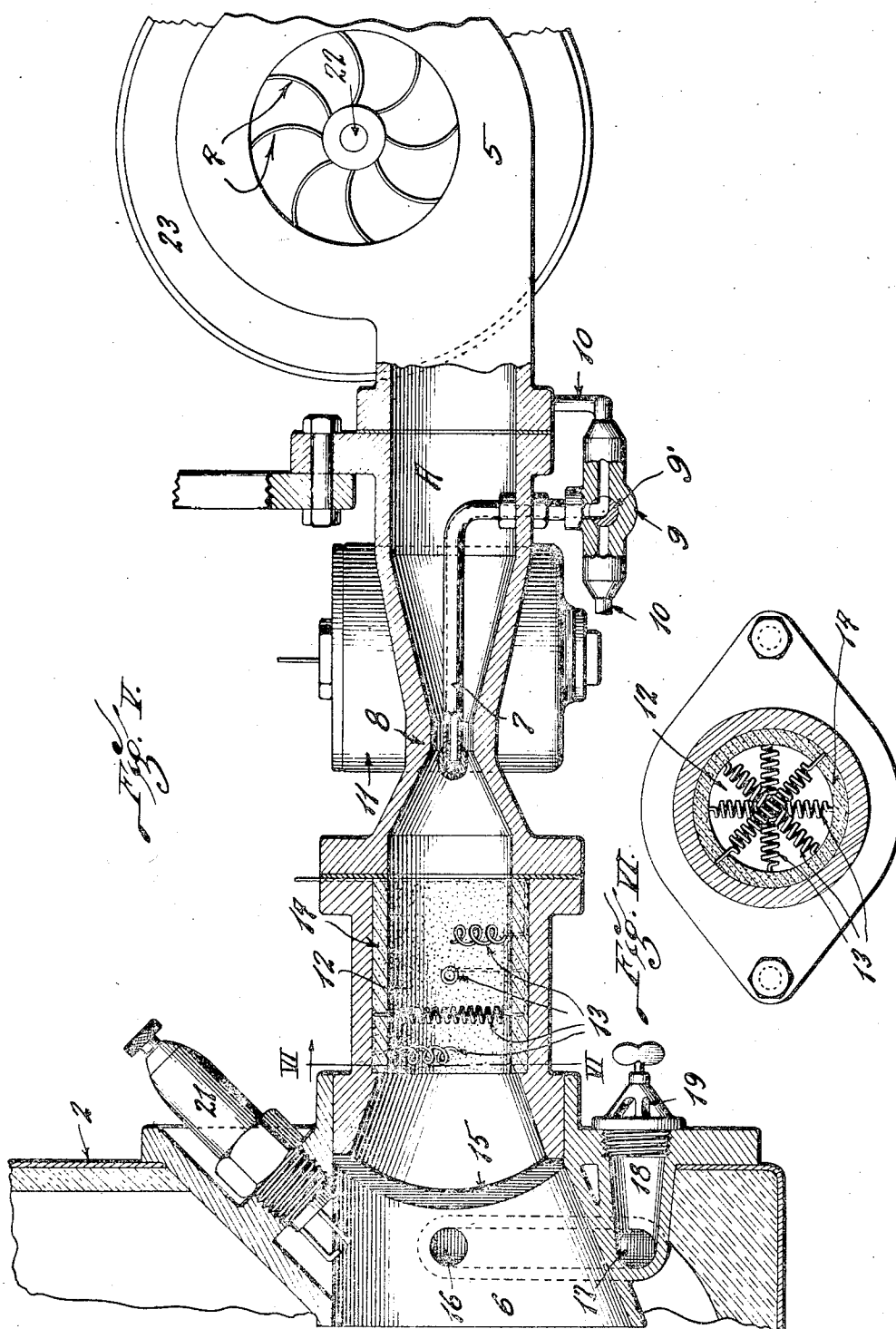
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

GEORGE F. MOORS, OF ST. LOUIS, MISSOURI, ASSIGNOR TO RECIP-ROTO ENGINE COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF DELAWARE.

BURNER.

Application filed November 26, 1919. Serial No. 340,855.

My invention relates to improvements in burners, and more particularly to a hydrocarbon burner wherein hydrocarbon oil is finely divided and mixed with air before it reaches the combustion chamber. An object of the invention is to provide an improved means for producing a combustible gas, which will be almost entirely consumed in the combustion chamber, thereby economizing in the use of fuel and eliminating undesirable waste products of combustion. Another object is to provide a highly efficient means for delivering the fuel to the combustion chamber.

With the foregoing and other objects in view, the invention comprises the novel construction, combination and arrangement of parts hereinafter more specifically described and illustrated in the accompanying drawings wherein is shown the preferred embodiment of the invention. However, it is to be understood that the invention comprehends changes, variations and modifications which come within the scope of the claims hereunto appended.

Briefly stated, the preferred form of the invention comprises a blower provided with a discharge duct containing a fuel ejecting nozzle and a heating chamber wherein the liquid fuel is vaporized and mixed with air before it reaches the combustion chamber. The air blast, passing from the blower, draws a fine spray of hydrocarbon liquid from the ejector nozzle and the mixture of air and finely divided liquid is projected onto the heating element, thereby vaporizing the liquid and mixing it with the air blast in the heating chamber. The combustible mixture is then forcibly discharged through a ported wall which separates the heating chamber from the combustion chamber. The ported wall may be in the form of a grid adapted to prevent a back-fire from the combustion chamber, so the outgoing mixture will not be ignited until it passes from the heating chamber. The present invention also includes means for admitting auxiliary air to the combustion chamber, a baffle whereby the burning fuel is distributed in the combustion chamber, and a combination of cooperating electrical elements which will be hereinafter described.

Fig. I is a side elevation, partly in section, illustrating a boiler equipped with a

burner constructed in accordance with this invention.

Fig. II is a diagrammatic view of the electrical elements.

Fig. III is a top or plan view of the baffle on to which the flame is discharged.

Fig. IV is an enlarged top or plan view, partly in section, of the vaporizing elements of the burner.

Fig. V is a vertical section, taken approximately through the center of the elements shown in Fig. IV.

Fig. VI is a transverse section on the line VI—VI, Fig. V, showing the heating elements.

The burner herein shown is applied to a steam boiler (Fig. I) provided with a number of water tubes 1 arranged in a housing 2, the lower portion of which forms a combustion chamber 3. The blast-producing device may be a rotary fan 4, arranged in a housing 5 provided with a long discharge duct A leading to a flaring discharge nozzle 6, which extends through the housing 2 of the combustion chamber 3. The flaring nozzle 6 constitutes a primary combustion chamber wherein the fuel is ignited before delivery to the main combustion chamber 3, and owing to the shape of the flaring nozzle 6 the mixture ignited therein can freely expand without causing an undesirable roaring sound.

A fuel ejecting nozzle 7 lies in the duct A at a point between the blower and the combustion chamber formed by nozzle 6. The duct A has a contracted portion 8 adjacent to the discharge end of fuel nozzle 7, said contracted portion being between the blower and the discharge end of nozzle 7, so a forcible blast of air will be discharged along the end of the fuel nozzle. This air blast tends to create a vacuum in the fuel nozzle, with the result of ejecting liquid fuel therefrom. The fuel nozzle 7 is connected to a 3-way valve 9 (Figs. IV and V). 10 designates tubes leading from the ends of valve 9 to fuel reservoirs 11 adapted to contain different liquid fuels, such as gasoline and kerosene. The valve proper designated by 9' in Fig. V may be operated to place either fuel reservoir in communication with the nozzle 7. Obviously, the valve can be adjusted for the delivery of very volatile fuel, such as gasoline, which will readily ignite

in the combustion chamber, and thereafter the valve can be manipulated for the delivery of the normal fuel, which may be kerosene or other comparatively inexpensive hydrocarbon liquid.

The spray of liquid fuel drawn from the fuel nozzle 7 is projected through a combined heating and mixing chamber 12 containing electrical heating elements 13, preferably in the form of coils of resistance wire. These coils are arranged at various angles, as shown by Fig. VI, so as to effectively distribute the heat throughout the mixture in the chamber 12. The fine spray of liquid discharged onto the hot coils is vaporized and converted into a combustible gas, which mixes with the air blast in the heating chamber. 14 designates a refractory lining for the heating chamber.

A ported wall 15 (Figs. IV and V) in the form of a concavo-convex grid, is located between the heating chamber 12 and the primary combustion chamber formed by the flaring nozzle 6. The outgoing mixture of heated air and hydrocarbon vapor is discharged through the grid 15, which serves as a baffle aiding in the mixing of the air and hydrocarbons. However, an important function of the grid is to prevent a back-fire in the heating chamber 12 where the hydrocarbons are mixed with the air to produce a desirable combustible fuel. The outgoing blast passing through the grid also tends to prevent a back-fire.

The mixture passing through the grid is usually too rich for perfect combustion, so I prefer to admit an auxiliary supply of air to the primary combustion chamber formed by nozzle 6. At opposite sides of nozzle 6 (Figs. IV and V) inlet ports 16 are formed, and these ports communicate with an air passageway 17 leading from a main air inlet 18. A damper, or valve, 19 at the inlet 18, may be manipulated to regulate the admission of auxiliary air.

A baffle 20 (Figs. I and III), located in the main combustion chamber 3, preferably consists of a pair of diverging deflector wings facing the nozzle 6, said wings being inclined downwardly from points near the upper end of nozzle 6, so as to deflect the burning mixture toward the bottom of the main combustion chamber. These deflector wings prevent the burning mixture from rising freely from the nozzle 6, and they result in a distribution of the burning fuel in the large combustion chamber, so a substantially uniform distribution of heat will be obtained below the boiler.

The flaring nozzle 6 serves as an ignition chamber for the fuel, and it is provided with a spark plug 21 whereby the fuel is ignited when the rotary fan 4 is actuated to begin the delivery of fuel. The fan is connected to one end of the armature shaft 22 of an

electric motor 23, and the opposite end of said shaft is provided with a circuit breaker in the form of a commutator 24, shown in Fig. II. The sparking device (Fig. II) may include a secondary coil 25 connected to the spark plug 21, and a primary coil 26 connected to a battery 27. A brush 28, contacting with circuit breaker 24, is connected to the primary coil 26 by means of a wire 29, and a similar brush 28' is connected to a wire 30 leading to the battery 27. The circuit of the primary coil is completed through a wire 31 leading from said coil to a switch 32 connected to the battery. The motor is energized through wires 33 and 34 connected to the wires 30 and 31, and the heating coils 13 are likewise connected to the wires 30 and 31, as shown in Fig. II.

The electrical elements consisting of the motor, spark plug and heating coils are all controlled by the switch 32. When the switch is closed, all of these elements will be energized. In starting the device, the coils 13 are instantly heated by the transmission of the electric current, and the motor driven fan is actuated to discharge the fuel through the heating chamber and thence to the discharge nozzle containing the spark plug 21. By combining the several electrical elements as herein shown, and placing them under the control of a single switch, I overcome the danger of discharging a large volume of explosive gas into the combustion chamber. When the motor is operated to begin the delivery of fuel, the heating elements are energized to heat and vaporize the fuel, and the spark plug is effective to ignite the hot mixture passing from the heating elements.

I claim:

1. A burner comprising a blower, an air passage leading from said blower, a fuel outlet nozzle in said passage, a restriction in said passage spaced from and surrounding said nozzle near the outlet end of said nozzle, a vaporizing chamber beyond said nozzle and said restriction, heating means in said vaporizing chamber, an expanding discharge nozzle leading from the vaporizing chamber, a grid formed across said discharge nozzle between the inlet and outlet ends of said discharge nozzle and an igniter beyond the grid.

2. A burner comprising a blower, an air passage leading from said blower, a fuel outlet nozzle in said passage, a restriction in said passage spaced from and surrounding said nozzle near the outlet end of said nozzle, a vaporizing chamber beyond said nozzle and said restriction, heating means in said vaporizing chamber, an expanding discharge nozzle leading from the vaporizing chamber, a concavo-convex grid formed across said discharge nozzle with its convex side toward the vaporizing chamber, said grid being spaced

at a distance from the inlet and outlet ends of said discharge nozzle and an igniter on the convex side of the grid.

3. A burner comprising means for producing a liquid spray and passing said spray to a heating chamber, means for heating said spray in said chamber to vaporize it, an expanding nozzle leading from the heating chamber, a grid formed across the nozzle and air inlet ports therein beyond the grid adapted to introduce air, whereby a combustible mixture is produced, the nozzle being adapted to gently expand the heated vapor before its passage through the grid, and to further expand its resulting burning product after passage through the grid and ignition means beyond said grid.

4. A burner comprising means for producing

a liquid spray and passing said spray to a heating chamber, means for heating said spray in said chamber to vaporize it, an expanding nozzle leading from the heating chamber, a grid formed across the nozzle and air inlet ports therein beyond the grid adapted to introduce air, whereby a combustible mixture is produced, the nozzle being adapted to gently expand the heated vapor before its passage through the grid, and to further expand its resulting burning product after passage through the grid, said heating element having vapor mixing means therein comprising the heating means, and ignition means beyond said grid.

In testimony that I claim the foregoing I hereunto affix my signature.

GEORGE F. MOORS.