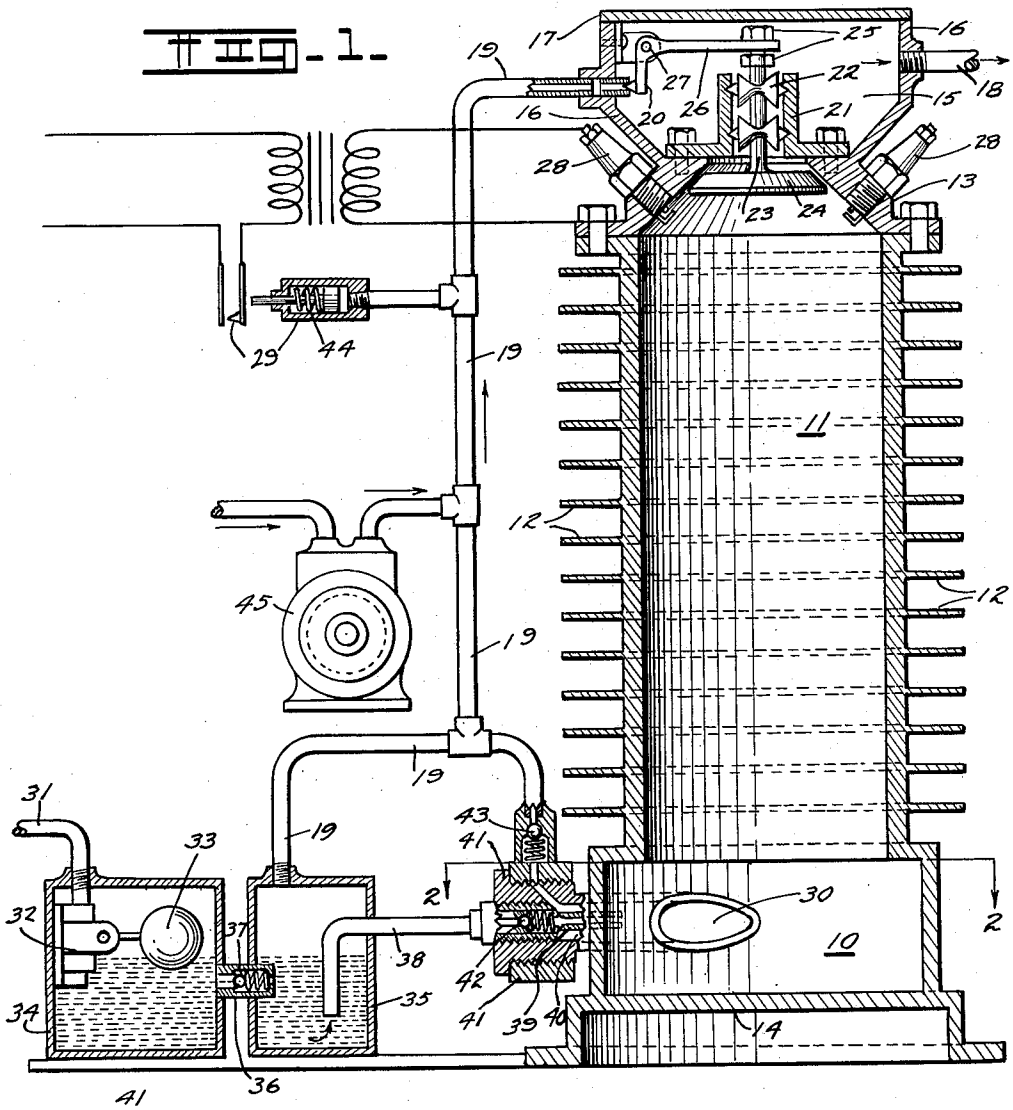
April 14, 1953 H. L. ERICKSON 2,634,804

APPARATUS FOR GENERATING HEAT

Filed Oct. 10, 1951

FIG. 1.



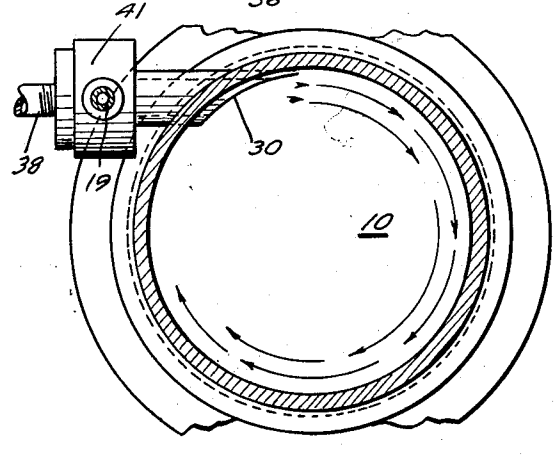


FIG. 2.

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APPARATUS FOR GENERATING HEAT

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4 Claims. (Cl. 158—1)

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This invention relates to a heating apparatus and more particularly to an apparatus for burning liquid or gaseous fuel and producing a maximum yield of heat therefrom.

The principal object of the invention is the provision of an apparatus for burning a gaseous or liquid fuel in a closed container so as to retain a maximum recovery of heat therefrom.

A further object of the invention is the provision of an apparatus for burning fuel under controlled conditions and in a stationary atmosphere.

A still further object of the invention is the provision of an apparatus for burning fuel in a closed container and holding the said burning fuel charge in the said container until the mechanical energy thereof has been translated into heat energy capable of being recovered from the said container.

The apparatus for burning liquid or gaseous fuel disclosed herein comprises a means of efficiently heating a desired medium through the automatic charging and burning of fuel in a container capable of holding the burning fuel charge and restraining its mechanical energy until the same has been dissipated in the form of heat. The apparatus disclosed is capable of continuous automatic operation and is capable of using a concentrated liquid fuel such as gasoline or other liquid hydrocarbon. The combustion chamber of the device may be utilized for heating air by direct convection or for the purpose of heating a fluid heating medium as desired and the entire device may be formed of relatively simple and inexpensive parts and is of relatively small size in comparison with its heating ability.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

The invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a plan view with parts broken away and parts in cross section.

Figure 2 is a horizontal section taken on line 2—2 of Figure 1.

By referring to the drawings and Figure 1 in particular it will be seen that a circular base 10

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has a cylindrical body member forming a combustion chamber 11 mounted thereon and preferably formed integrally therewith. The cylindrical combustion chamber 11 is preferably provided with heat dissipating fins 12 and is closed at its upper end by a head 13. The lower end of the base 10 forms a closure 14 defining the opposite end wall of the combustion chamber 11. The head 13 has a venting chamber 15 formed therein as defined by side walls 16 and an uppermost closure 17. An exhaust pipe 18 communicates with the venting chamber 15 on one side thereof and an air inlet pipe 19 communicates with the venting chamber on the opposite side thereof. A valve 20 normally closes the air inlet pipe 19.

The head 13 carries a central vertical body member 21 which positions vertically arranged and horizontally disposed pairs of rollers 22 which serve as movable guides for a valve stem 23, the lower portion of which defines a valve 24. It will be observed that the valve 24 is disposed within a conical restricted upper end portion of the head 13 and is movable vertically against the same so as to close the passageway normally existing between the combustion chamber 11 and the vent chamber 15 and through the body member 21.

The upper end of the valve stem 23 has a pair of spaced nuts 25 threaded thereon and a bifurcated arm 26 is engaged therebetween, it being observed that the bifurcated arm is integrally formed with the valve 20 and pivoted as at 27 to one of the walls 16 of the venting chamber. The weight of the valve 24, valve stem 23 and the arm 26 is sufficient to normally maintain the valve 20 in closed position with respect to the air inlet pipe 19.

The head 13 is apertured for the reception of spark plugs 28 and they are electrically connected with a suitable power source in series connection with a switch 29.

Fuel is introduced into the base 10 of the combustion chamber 11 through an inlet orifice 30 which is located at an angle to the point of communication with the base 10 so that fuel introduced thereinto will travel in a circular motion, as shown by the arrows in Figure 2 of the drawings. The fuel is supplied from a fuel line 31 which is in communication with a float valve 32, the float portion 33 of which rides the liquid level in a fuel receiving bowl 34. A fuel delivering bowl 35 is in communication with the fuel receiving bowl 34 by way of an intercommunicating passageway 36 which incorpo-

rates a check valve 37 permitting flow of fuel from the fuel receiving bowl 34 to the fuel delivering bowl 35. A fuel delivering pipe 38 extends from a point near the bottom of the fuel delivering bowl 35 to a nozzle 39 positioned in a mixing chamber 40 and defined by a hollow body member 41. A check valve 42 permits fuel from the pipe 38 to flow into the nozzle 39 but does not permit fuel or pressure to move from the nozzle 39 into the pipe 38.

Compressed air is delivered to the mixing chamber 40 from the air supply line 19 and through a check valve 43 which permits air to flow into the mixing chamber 40 but does not permit air or pressure to flow backwardly into the air supply line 19. The fuel receiving bowl 35 is also in communication with the air supply line 19 as is the switch 29 which is normally biased to open position by a spring 44 and which closes when air pressure in the supply line 19 reaches a predetermined point. In order that the air pressure in the air supply line 19 can be maintained, an air compressor 45 is provided.

In operation, fuel from the fuel receiving bowl 34 flows through the check valve 36 and into the fuel delivering bowl 35 to establish the same level therein as present in the fuel receiving bowl 34. Air from the compressor 45 flows through the line 19 and through the check valve 43, into the mixing chamber 40 and through the orifice 30 into the chamber 11. The air flows upwardly through the head 13, the guide member 21 and into the venting chamber 15 and outwardly through the exhaust pipe 18. At the normal operating pressures of the compressor 45 the valve 24 remains open and the combustion chamber 11 is thus in communication with the atmosphere through the exhaust pipe 18.

Simultaneously with the delivering of air into the mixing chamber 40, air is delivered to the fuel delivering bowl 35. As the air pressure is established therein, the check valve 37 closes and the air forces the fuel outwardly through the pipe 38 and the nozzle 39 and into the mixing chamber 40 where it is atomized and conveyed along with the air into the combustion chamber by way of the orifice 30. As heretofore mentioned, the introduction of the fuel charge is in a rotating manner, as shown in Figure 2 of the drawings.

As the fuel charge is carried upwardly through the combustion chamber, air pressure in the line 19 overcomes the tension of the spring 44 in the pressure switch 29 and closes the circuit energizing the spark plugs 28 whereupon the fuel charge in the combustion chamber 11 is ignited. The ignition of the fuel charge results in an initial expanding action of the burning gases of the same which immediately closes the valve 24 and the check valves 42 and 43 which control the fuel and air lines communicating with the mixing chamber 40. The combustion chamber 11 is thus closed with respect to the atmosphere as well as the air and fuel lines and the fuel charge burns in the closed combustion chamber 11. The cylindrical body member defining the combustion chamber 11 is sufficiently strong to hold the increasing pressures of the burning fuel charge and the mechanical energy thus being restrained is required to give off its energy in the form of heat.

During the time of the burning of the fuel charge in the combustion chamber 11, the valve 20 is held in open position by the valve 24 having been moved upwardly into closed position against the head 13. Such action bleeds the air line 19 through the venting chamber 15 and the exhaust pipe 18 thus reducing the pressure in the air line 19 to approximately atmospheric pressure and at the same time conveying any fuel charge remaining in the venting chamber 15 outwardly and away therefrom.

When the burning fuel charge has given up its energy in the form of heat through the fins 12 and the pressure in the chamber 11 has dropped, the valve 24 will again open by gravity action which closes the valve 20 and permits the compressor 45 to re-establish pressure in the air pipe 19 and the device re-cycles.

It will thus be seen that the operation of the device is dependent upon the alternate rise and fall of air pressure in the air supply line 19 as the falling of the pressure therein at such time as the valve 20 is open permits the fuel to refill the fuel delivery bowl 35 by the introduction of a sufficient quantity of fuel therein for the subsequent charging portion of the cycle. It will also be seen that the pressure switch 29 operates responsive to the fluctuation of the air pressure in the supply line 19, thus alternately energizing and de-energizing the spark plugs 28 at the proper times.

It has been determined that the firing interval of the apparatus as herein disclosed will run approximately 15 to 20 seconds, a majority of this time comprising the period of heat transfer necessary to dissipate the fuel energy to a point sufficient to permit the valve 24 to open and the re-cycling of the device to begin.

The compressor 45 is preferably of the continuous duty type and is driven by a suitable integrally formed electric motor also of the continuous duty type and it will be observed by those skilled in the art that the cost of operating the device is relatively low compared with the quantity of heat produced therefrom. In burning such liquid hydrocarbon fuels as gasoline, for example, relatively small sized apparatus efficiently converts the fuel energy to heat energy which may be used in a desired manner.

It will thus be seen that a novel apparatus for burning fuel in a static condition under completely automatic control has been disclosed and which apparatus meets the several objects of the invention.

Having thus described my invention, what I claim is:

1. Heating apparatus comprising a combustion chamber, a mixing device for introducing air and fuel into said combustion chamber, valves in said mixing device preventing flow of air and fuel from said combustion chamber, said combustion chamber having an outlet opening therein and a valve arranged partly within said combustion chamber to close said opening responsive to pressure generated by combustion in said chamber and a spark plug in said combustion chamber for igniting a fuel charge therein.

2. An automatically re-cycling heating apparatus comprising in combination a combustion chamber, a mixing device for introducing air and fuel mixtures thereinto, valves in said mixing device preventing return flow therethrough, said combustion chamber having an outlet opening therein and a valve arranged to close said opening upon combustion occurring in said chamber, a spark plug in said combustion chamber, a source of electricity for said spark plug, a secondary valve connected to and operated by

said first named valve, said secondary valve responsive in opening to closing motion of said first named valve, a source of air pressure and an air line in communication with said source and said secondary valve, a pressure operated switch in communication with said air line and controlling said electricity source a source of liquid fuel in communication with said mxing device, said air line in communcation with said source of fuel and said mixer whereby opening of said secondary valve responsive to closing of said first named valve vents said air line and opens said pressure switch and stops flow of fuel to said mixing device.

3. The heating apparatus disclosed in claim 2 and further characterized by the source of liquid fuel comprising a fuel delivering bowl having a discharge pipe terminating near the bottom thereof and a relatively larger liquid receiving area thereabout defining a relatively large air pressure chamber thereabove.

4. The heating apparatus disclosed in claim 2

and wherein said first named valve is mounted without said combustion chamber and extends within said combustion chamber through said outlet opening thereof and is movable into said outlet opening and wherein said secondary valve is without said combustion chamber.

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