May 10, 1932. R. E. LASLEY 1,857,556

POWER PLANT

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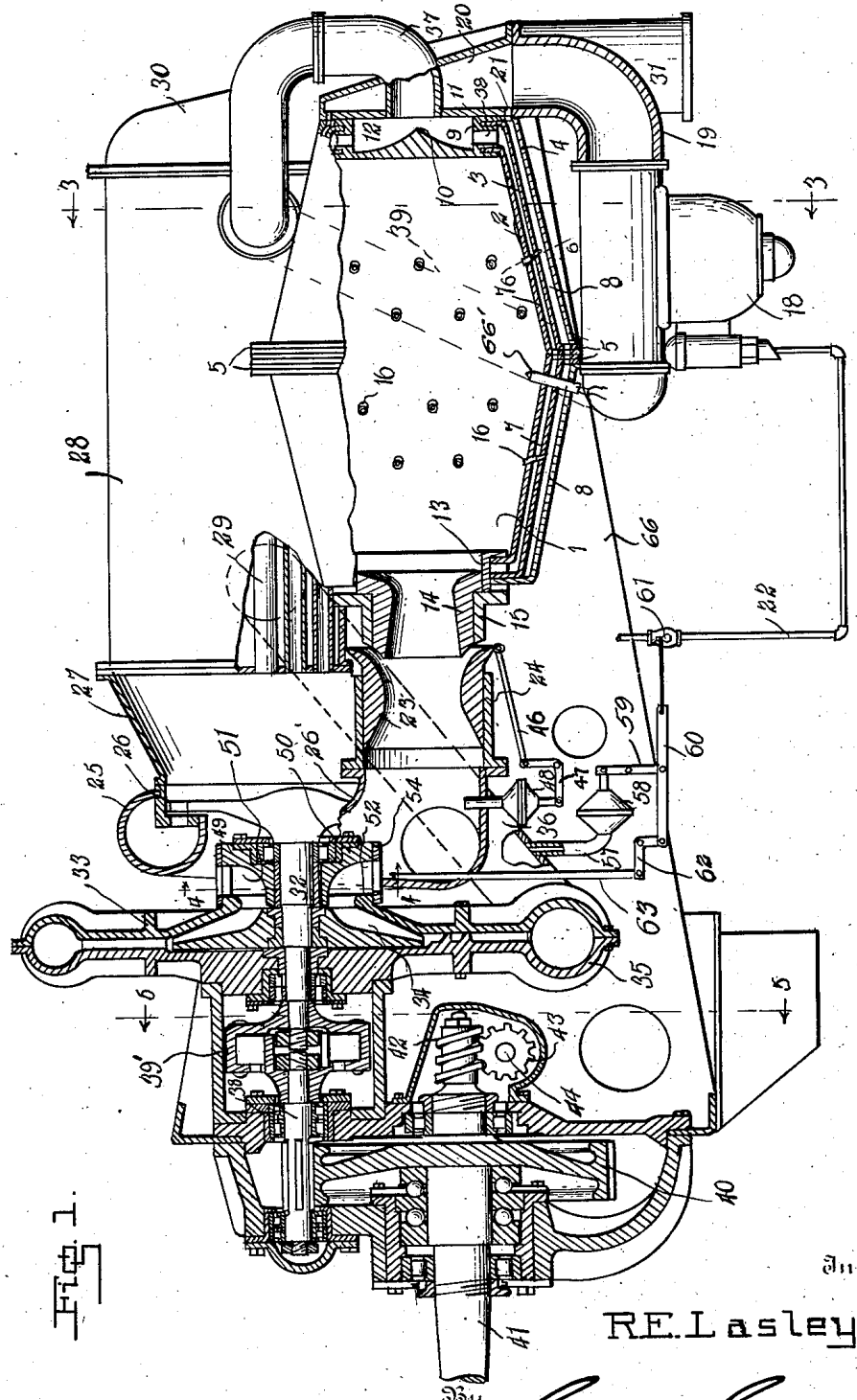

Fig. 1.

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Fig. 2.

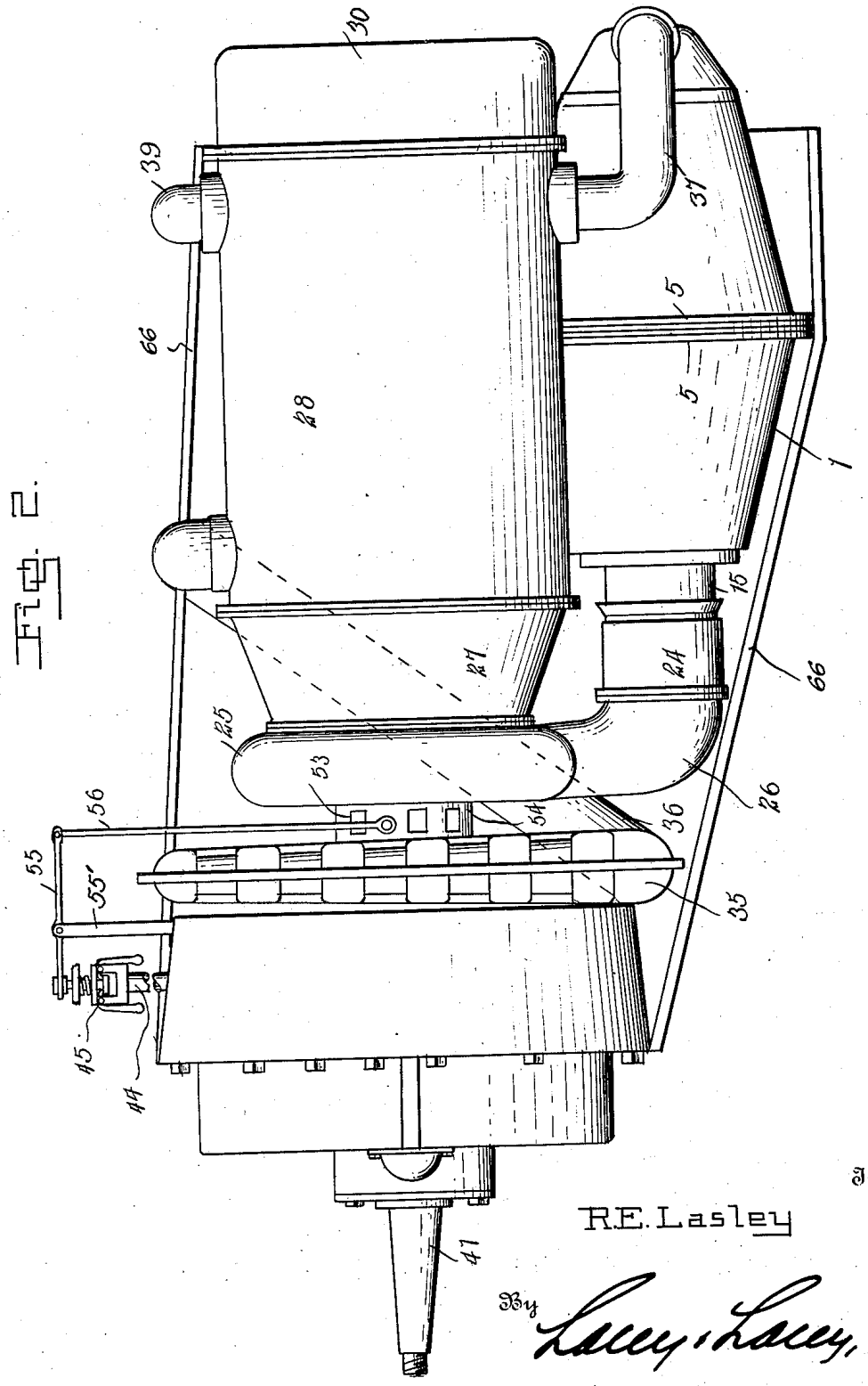

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Fig. 4.

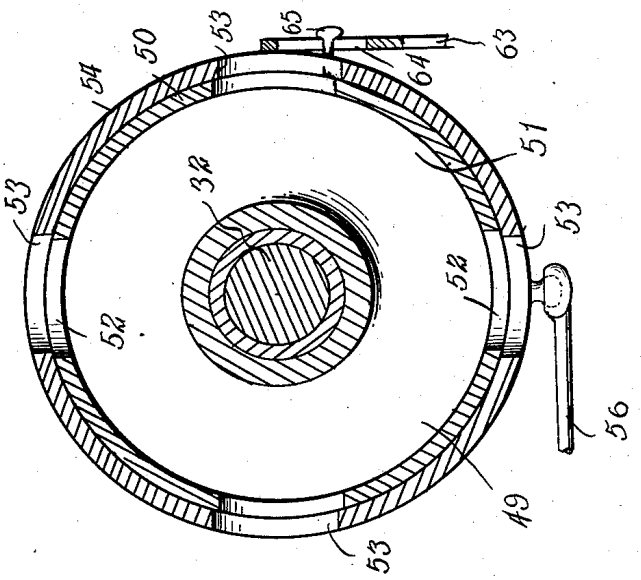

Fig. 3.

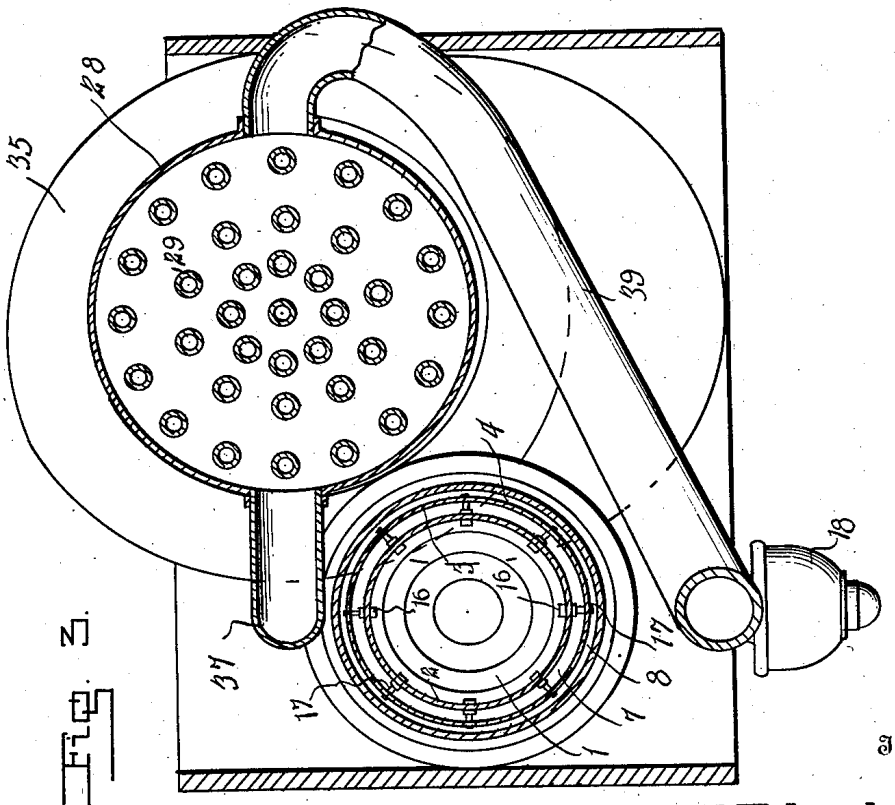

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Fig. 6.

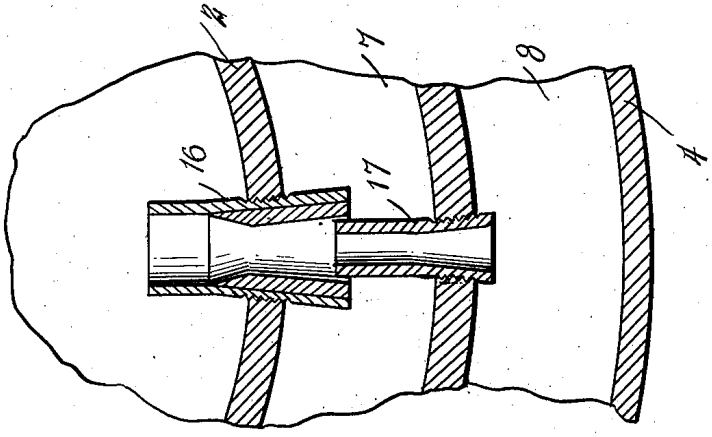
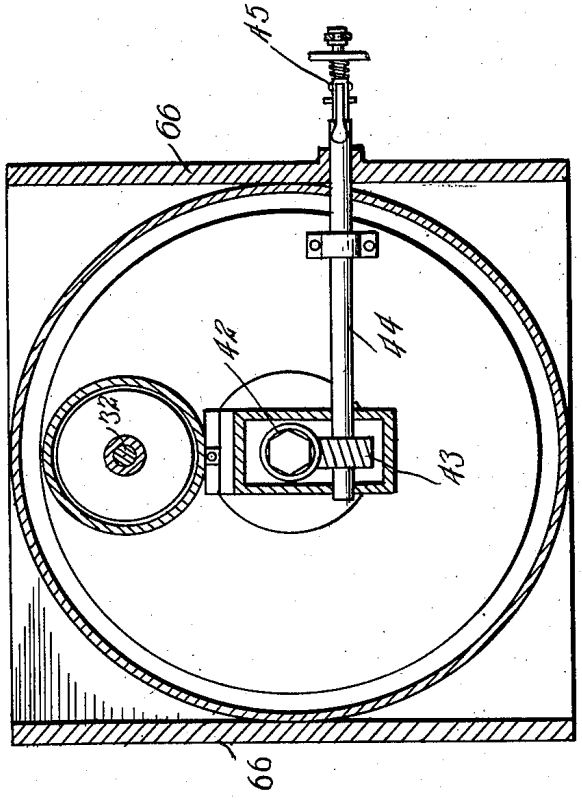


Fig. 5.



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UNITED STATES PATENT OFFICE

ROBERT EDLEY LASLEY, OF LIBERTYVILLE, ILLINOIS

POWER PLANT

Application filed May 31, 1928. Serial No. 281,902.

The present invention is directed to improvements in power plants and is an improvement on my co-pending application, Serial No. 163,409, filed December 8, 1926.

The primary object of the invention is to provide a power plant including a combustion chamber constructed in a manner to eliminate the use of a refractory lining, thereby providing a combustion chamber which is extremely light, and, consequently, admirably adapted for use in connection with air craft.

Another object of the invention is to provide a power plant including a combustion chamber so constructed that air and fuel will be effectively mixed to produce a combustible fuel for introduction into the combustion chamber under pressure produced by a compressor in order that the products of combustion will be discharged from the combustion chamber at increased volume and at a constant pressure produced by the compressor.

Another object of the invention is to provide a power plant wherein air and fuel are compressed by a compressor in a heated state to provide a highly combustible mixture.

With these and other objects in view, this invention resides in the novel features of construction, formation, combination and arrangement of parts to be hereinafter more fully described, claimed and illustrated in the accompanying drawings, in which:

Figure 1 is a side view, partly in section.

Figure 2 is a top plan view.

Figure 3 is a sectional view on line 3—3 of Figure 1.

Figure 4 is a sectional view on line 4—4 of Figure 1.

Figure 5 is a sectional view on line 5—5 of Figure 1.

Figure 6 is a sectional view on line 6—6 of Figure 1.

Referring to the drawings, the numeral 1 designates the combustion chamber which consists of a plurality of concentrically arranged tubular metallic sections 2, 3 and 4, of conical formation, the major ends of which are united by flanges 5, said flanges being provided with openings 6 in order that the annular chambers 7 and 8 defined by the walls of the sections 2, 3 and 4 will be in communication. The sections are of truncated conical formation and have their major ends connected, the major diameter of the combustion chamber will be centrally located.

The minor ends of the sections are fitted in the ported rim 9, said rim having a conical spreader 10 carried thereby, and having a closure plate 11 to provide a chamber 12, the purpose of which will later appear.

The forward ends of the sections have fitted therein a ring 13 which supports the rear end of a nozzle 14, said nozzle being formed from any suitable refractory material, and being engaged in a protective ring 15. A plurality of rows of circularly alined nozzles 16 are threaded in the walls of the sections 2 and are alined with similarly arranged nozzles 17 threaded in the walls of the sections 3, the latter nozzles being extended for a short distance into the nozzles 16, as shown in Fig. 6. It will be observed that the nozzles are inclined in a direction toward the forward end of the combustion chamber 1.

A carbureter 18 is provided and may be of any desired construction, said carbureter having leading therefrom a fuel conducting pipe 19 which communicates with the chamber 20, the inner wall of which is produced by the closure plate 11, said plate having an opening 21 therein which opens into the compartment 8 in order that fuel from the carbureter 18 can freely enter the compartment 8 for discharge through the nozzle 17. Fuel is conducted to the carbureter 18 through the pipe line 22 which leads from a supply tank (not shown). Coaxial with the nozzle 14 is a nozzle 23 which is slidable in the sleeve 24, said nozzle communicating with the housing 25 of the turbine 26 through the conduit 26′, said turbine exhausting into the flared head 27 which closes the forward end of the air superheating drum 28, the hot exhaust gases passing through the tubes 29 mounted longitudinally within the drum, said tubes discharging into a head 30 which exhausts through the nozzle 31 to atmosphere.

The turbine shaft 32 operates a compressor 33 of conventional form, the fan blades 34

thereof forcing air into the housing 35 and from thence to the pipe 36 to the forward end of the drum 28 in order that fresh air induced by the compressor will be preheated by the heat radiated from the tubes 28. A part of this air is discharged through a pipe 37, which extends through the chamber 12 against the conical spreader 10 and enters the chamber 7 through ports 38 of the rim 9. A part of this preheated air will also flow through the pipe 39 which leads to the carbureter 18 to carry fuel therefrom into the pipe 19 and into the compartment 8. The turbine drives a shaft 38 and interposed between said shaft is a flexible connection 39' of well known construction. The shaft 38 is geared to the driving gear 40 fixed to the shaft 41, which, in this instance, drives a propeller. The shaft 41 has a worm 42 upon its rear end for driving the worm 43, the latter worm driving a transverse shaft 44 which drives a generator (not shown) and also the centrifugal governor 45 for a purpose to be hereinafter described.

In order to control the admission of fresh air into the products of combustion flowing into the nozzle 23 from the combustion chamber 1, the rear end of a link 46 is pivotally connected thereto, the forward end of which is pivoted to one end of the bell crank lever 47, the other end of the lever being connected to the thermostat 48. It will be thus apparent that the link 47 will control the sliding movement of the nozzle 23 to regulate the mixture of atmospheric air with the motive fluid passing from the combustion chamber 1 through the nozzle 14.

The shaft 32 rotates in a collar 49, the front face of which is formed with an annular rim 50 which defines an air chamber 51, said chamber opening into the compressor housing 35 in order that air can be drawn thereinto for furnishing the compressor with atmospheric air. The rim 50 has a plurality of slots 52 adapted to cooperate with the slots 53 formed in the band 54 which is rotatably engaged upon the rim. An arm 55 is pivotally supported by a bracket 55' and has its rear end pivotally connected to one end of a link 56, said link having its other end pivotally connected to the band 54, the forward end of the arm 55 being connected with the governor 45. Obviously, when the speed of the shaft 44 varies, the governor will operate to rotate the band, whereupon the admission of air to the chamber 51 will be controlled.

In the pipe 36, which conducts the air from the compressor to the drum 28, is a pipe 57 which leads to the pressure regulator 58 of conventional form, which has a lever 59 connected thereto for sliding the bar 60, the rear end of said bar being connected to the valve 61 in the fuel line 22, while the forward end of said bar is connected to one arm of the bell crank lever 62. The other arm of the lever 62 has connected thereto the lower end of a link 63, said link having a slot 64 in its upper end for engaging the stud 65 carried by the band 54. It will be thus seen that should the connection 39' between driving shaft 38 and shaft 32 break and the compressor race, the pressure in the pipe 36 will be increased, thus operating the regulator 58 to shift the rod, thus moving the link 63 to rotate the band 54 in order that the slots 53 thereof will move fully out of registration with the slots 52, thus cutting off the air supply and simultaneously the fuel supply, since the rod 60 will also close the valve 51. Owing to the slot 64 in the link 63, said link, under normal conditions, will not affect the movement of the band, this link only operating the band should the compressor race.

To ignite the combustible mixture in the chamber 1, the hot point 66' is employed and extends through the walls of the sections 2, 3 and 4.

In operation, the compressor will force air to the drum 28 through the pipe 36 and around the pipes 29, the pipes being maintained hot by the exhaust gases passing from the turbine. Part of the heated air will pass through the pipe 39 to the carburetor 18, whereas the portion flowing through the pipe 37 enters the chamber 12. The air entering the chamber 8 will be mixed with fuel flowing from the carburetor which is too rich to ignite until mixed with additional air. The fuel discharging from the nozzle 17 will mix with air flowing into the chamber 7 from the chamber 12 for ignition in the combustion chamber 1. The products of combustion will be discharged from the combustion chamber into the turbine 26 at increased volume and under constant pressure produced by the compressor 33. The construction of the combustion chamber is such that the employment of a refractory lining is unnecessary, since the arrangement of the compartments 7 and 8 are such that the sections will be maintained in a comparatively cool state and will not be subjected to intense heat, thus prolonging the life of the combustion chamber. Further, it will be observed that the nozzles are so arranged that the combustible fuel will be ejected toward the longitudinal axis of the combustion chamber.

The units of the plant are preferably confined between side frames 66 which are so arranged that the parts of the plant will be effectively supported and housed, but it will, of course, be understood that other means may be used for mounting the plant. The mixture in the combustion chamber in ignited by the plug 66'.

What is claimed is:—

1. In combination, a combustion chamber including an annular fuel compartment and

an annular air compartment, a compressor for simultaneously forcing heated air and fuel to the air and fuel compartments for forming a combustible fuel for discharge into the combustion chamber, means for igniting the charge therein, means for discharging the products of combustion from the combustion chamber, means for admitting an additional supply of atmospheric air to said discharging means for effecting a mixture with the products of combustion and means controlled by the temperature of the products of combustion for regulating the mixture of the additional supply of atmospheric air with the products of combustion flowing from the combustion chamber.

2. In combination, a combustion chamber including outer and inner sections and an intermediate section, said sections being spaced to provide annular fuel and air compartments. Mixing nozzles carried by the inner section, fuel nozzles carried by the intermediate section and extending into the mixing nozzles, a heater, a carbureter, means for conducting air from the heater to the air compartment and through the carbureter to the fuel compartment, the fuel and air being mixed in the mixing nozzles and discharged into the combustion chamber.

3. In combination, a combustion chamber consisting of a plurality of concentrically arranged sections defining annular fuel and air compartments, a discharge nozzle fitted in one end of the combustion chamber, a rim fitted in the other end thereof and having ports therein communicating with the air chamber, a plate supported by the rim and having openings therein communicating with the fuel compartment, an air heater, a carburetor, means for conducting heated air from the heater through the carbureter and openings into the fuel compartment and through the ports into the air compartment, and means affording communication between the air and fuel compartments for mixing the air and fuel for discharge into the combustion chamber.

4. In combination, a combustion chamber comprising a plurality of concentrically arranged sections defining annular fuel and air compartments, a discharge nozzle fitted in one end of the combustion chamber, a rim fitted in the other end thereof, a spreader supported by the rim, said rim having a plurality of ports communicating with the air compartment, a plate supported by the rim and having openings therein communicating with the fuel compartment, an air heater associated with the combustion chamber, a carbureter, means for conducting a portion of the air from the heater into the carbureter and through the openings into the fuel compartment, and a portion thereof through the ports into the air compartment, and means for mixing fuel and air and discharging it into the combustion chamber.

5. In combination, a combustion chamber including concentrically arranged sections defining an annular fuel compartment and an annular air compartment, air nozzles carried by the sections forming the air compartment, fuel nozzles carried by the sections forming the fuel compartment, the air nozzles being entered by the fuel nozzles, a heater, means for forcing air through the heater, and means for distributing the heated air to the fuel and air compartments, the fuel and air mixing in the fuel and air nozzles for discharge into the combustion chamber.

In testimony whereof I affix my signature.

ROBERT EDLEY LASLEY.