

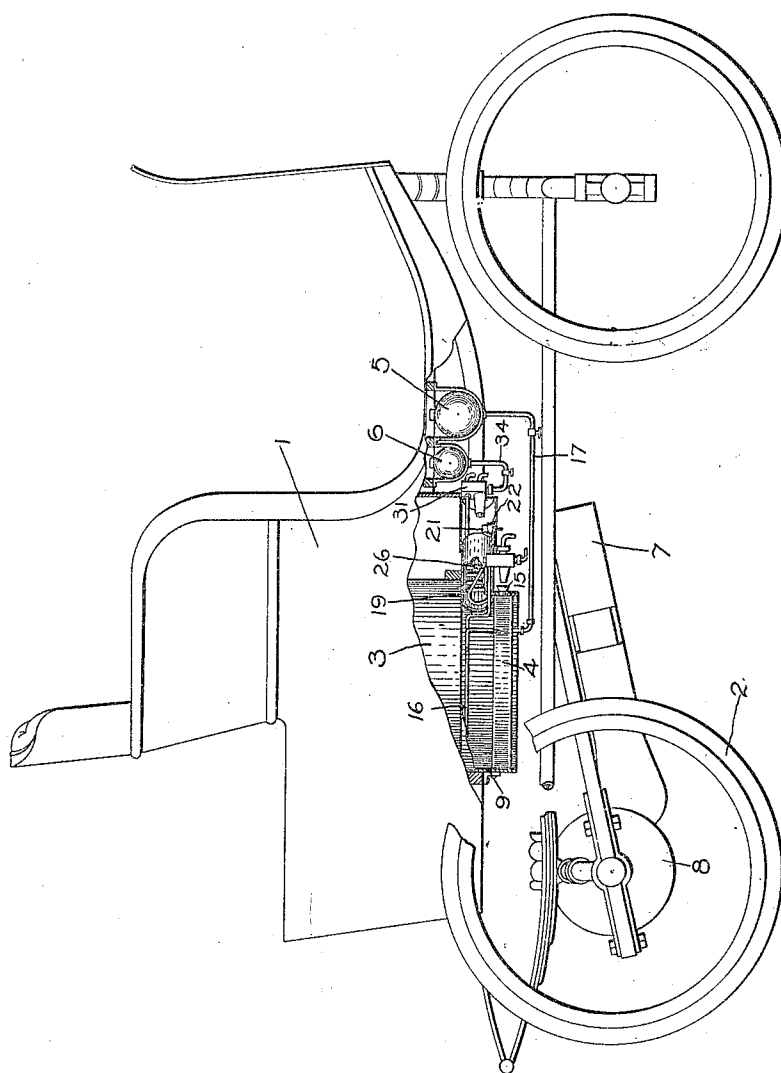
A. A. BALL, JR.
 STARTING DEVICE FOR BURNERS.
 APPLICATION FILED JAN. 24, 1902.

974,111.

Patented Nov. 1, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
Robert L. Chapman.
Alex. Macdonald.

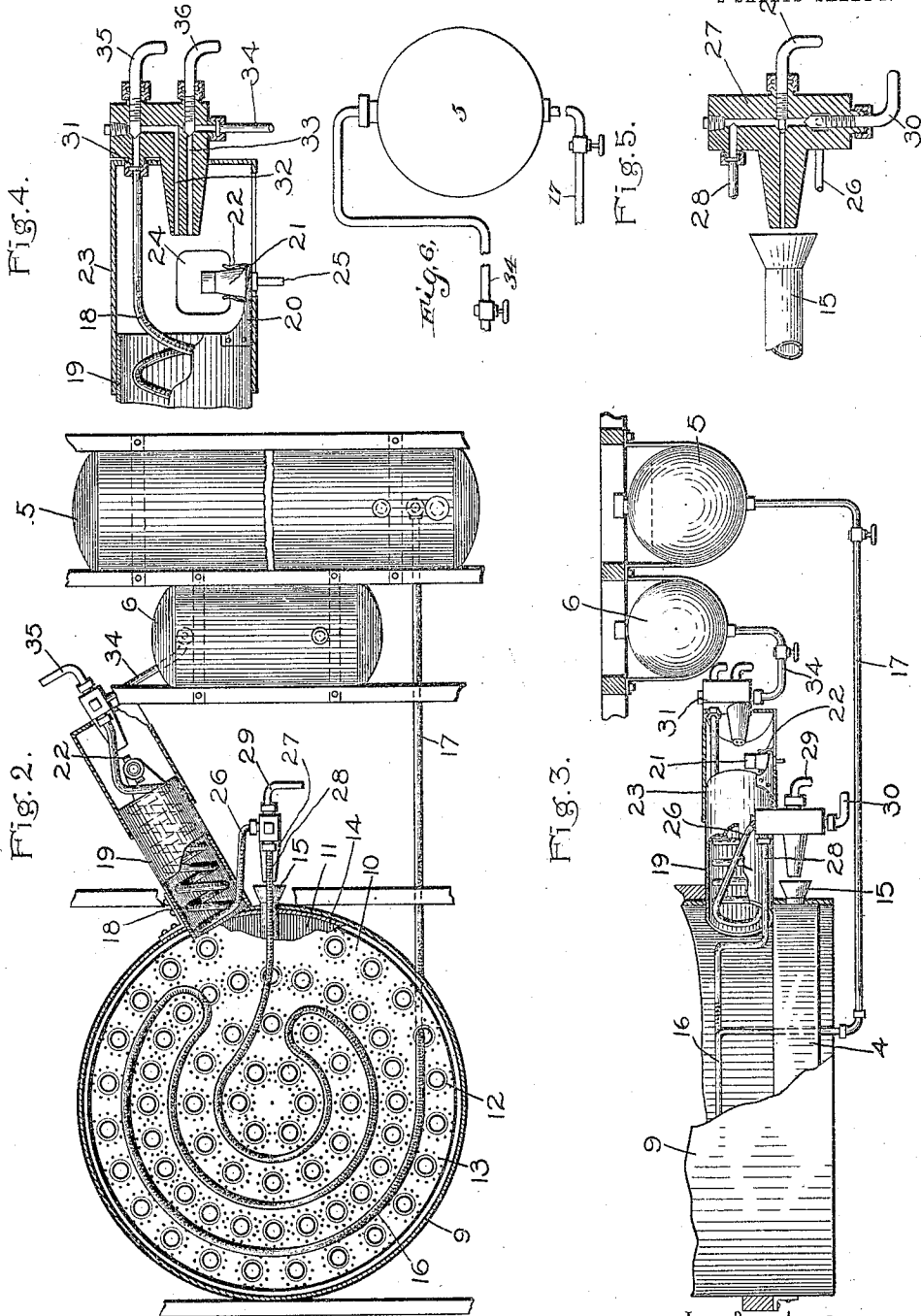
Inventor,
 Augustus A. Ball Jr.
 By *Allen H. Davis*
 Att'y.

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UNITED STATES PATENT OFFICE.

AUGUSTUS A. BALL, JR., OF LYNN, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

STARTING DEVICE FOR BURNERS.

974,111.

Specification of Letters Patent.

Patented Nov. 1, 1910.

Application filed January 24, 1902. Serial No. 91,013.

To all whom it may concern:

Be it known that I, AUGUSTUS A. BALL, Jr., a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Starting Devices for Burners, of which the following is a specification.

Hydrocarbon burners as ordinarily constructed require an auxiliary starting device. One type of burner with which I am familiar utilizes, in starting, the liquid fuel from the main tank or other source of supply, while another type requires that the initial heating for starting be accomplished by some auxiliary means, using alcohol, gasoline, or some similar material.

My invention relates to the former type of starting devices and has for its object to improve their construction and operation.

The scope of the invention will be more fully described and claimed hereinafter.

In the accompanying drawings which illustrate an embodiment of my invention, Figure 1 is a side elevation of the vehicle with certain of the parts broken away; Fig. 2 is a plan view of the burner and starting device; Fig. 3 is a side elevation of the burner and starting device with certain of the parts broken away; Fig. 4 is a sectional view of the nozzle for supplying fuel to the starting device; Fig. 5 is a sectional view of the nozzle for supplying fuel to the main burner, and Fig. 6 is a view illustrating a slight modification where a single tank is employed to furnish air pressure for starting and fuel for the system.

1 represents a spring-supported vehicle body, which is mounted on wheels 2. In order to simplify the matter of illustration, the steering mechanism and certain of the other parts have been omitted. Situated within the vehicle body is a boiler 3, of any suitable construction, and located below the boiler is a burner 4. Secured to the under side of the floor of the body in any suitable manner are a fuel tank 5 and an air tank 6. Steam from the boiler is utilized in the engine 7 for propelling the vehicle through suitable gearing inclosed in the case 8.

Referring more particularly to Figs. 2 and 3, 9 represents the casing which surrounds the burner 4. The burner is circular in out-

line and is closely fitted into the lower end of the boiler casing. Any suitable type of burner utilizing hydrocarbon vapor may be employed, the one shown in the drawings representing a type which I have found to be satisfactory. It consists of top and bottom plates 10 and 11, which are perforated to receive the air-carrying tubes 12, the latter being surrounded by a series of burner openings 13. The sides of the burner are closed in by a circular wall 14. Between the top and bottom plates and the side wall a mixing chamber is formed for receiving vapor and air from the injection tube 15. I have found the injection type of burner to operate very satisfactorily in connection with my improved starting device, but I do not wish to be understood as limiting myself to the particular kind of burner shown, since the starting device is capable of being used with burners of varying characters.

Situated above the burner at a point where it can be acted upon by the flames is a vaporizing tube 16. The tube is coiled in a manner to present an extended area to the flames in order that the liquid fuel shall be fully vaporized before entering the burner nozzle. One end of the vaporizer is connected by the pipe 17 with the fuel tank 5, while the other end is connected to the main nozzle. It is necessary with a system of this kind to put the fuel under pressure in order to force it through the vaporizer and into the burner nozzle. This may be done, as in the present instance, by subjecting the tank 5 to air pressure, or by inserting a pump in the connection between the tank and the vaporizer. In addition to the main vaporizer a second or auxiliary vaporizer 18 is employed, the latter being intended for starting purposes only, but under certain conditions of service such, for example, as when the demand for steam is great, it may be kept in continuous operation. The auxiliary vaporizer tube is inclosed in a cylindrical casing 19, which is bolted or otherwise secured to the casing 9 of the boiler. Extending from the tube is a support 20, on which is mounted the starting cup 21, the latter being held in place by spring clips 22, or other suitable means. Surrounding the cup 21, in a manner to protect it from gusts of wind, is a casing 23, provided with an

opening having a cover or door 24, preferably of mica, through which a match may be inserted for starting the apparatus into operation. The cup is placed well up underneath the body of the vehicle, where it is protected from gusts of wind, and at times will be found to work satisfactorily without the use of the casing 23. The lamp is provided with a downwardly extending handle 25, which is used when it is desired to extinguish the flame, as will be herein-
after explained.

One end of the auxiliary vaporizer 18 is connected by the pipe 26 with the main burner nozzle 27. Fuel from the main vaporizer is admitted to the main burner nozzle through the pipe 28, and it will be seen that this pipe is located above the opening leading into pipe 26, the latter being connected to the auxiliary burner. To put the matter in a different way, the passage communicating with the pipe 26 is beyond the pipe 28 and the nozzle opening. The object of this arrangement is to insure that all of the oil shall be drained out of the nozzle opening. I have found that when a body of relatively cool oil is caught between a body of vapor and the opening in the burner nozzle, and is ejected therefrom, it will cause the burner to give off a disagreeable odor due to incomplete combustion, and to produce soot, but where the parts are arranged as shown in Fig. 5 this objection is entirely obviated.

In order to regulate the supply of fuel to the injection tube 15 an adjustable valve 29 is employed. This valve is provided with a reduced end having a conical tip which seats itself on a surface formed at the entrance of the nozzle opening. The object in providing the reduced portion is to enable the fuel from the vaporizer pipe 28 to flow past it into and through the pipe 26 to the auxiliary vaporizer. The supply of fuel to the auxiliary vaporizer is under the control of the valve 30 located on the main nozzle support. The object in placing the valve 30 on the main nozzle support or structure is to prevent the accumulation of oil in the pipe 26. After the parts have been properly heated, the valve 29, admitting vapor to the nozzle, can be opened and the valve 30, controlling the fuel supply to the auxiliary vaporizer, closed.

The outer end of the auxiliary vaporizer 18 is connected to an auxiliary nozzle 31, which is provided with a fuel passage 32 and an air passage 33. The fuel passage 32 is in communication with the tube of the auxiliary vaporizer, while the passage 33 is in communication with the air tank 6, through the pipe 34. Valves 35 and 36 are provided for cutting off the supply of fuel and air to the passages 32 and 33. The auxiliary nozzle 31 at starting operates as

an atomizer; and the fuel, after passing through the upper passage 32, mingles with the air from the passage 33, thus forming an inflammable mixture which is fired by the flame from the starting cup 21.

In starting the system into operation the valve 35, in the auxiliary nozzle, is opened, thus permitting fuel to flow into the starting cup 21, which can be moved toward the nozzle for this purpose. After the cup has received a sufficient amount of fuel it is moved to its normal position and lighted, and the valve 36, admitting air to the passage 33, is opened; this causes an inflammable mixture which is fired by the flame from the starting cup. After the atomizer or auxiliary nozzle has been in operation long enough to heat the auxiliary vaporizing tube 18 to the proper temperature, the supply of air may be cut off by closing the valve 36. Under this condition of operation the vapor which is discharged from the nozzle will traverse the tube 19, and draw with it an amount of air sufficient to cause complete combustion. The flames issuing from the tube strike the main vaporizer near the main nozzle, and as soon as it is sufficiently heated the main nozzle will discharge vapor through the injection tube into the interior of the burner; and after it passes through the fuel openings 13 ignition will take place, due to the flames from the starting device. After the main vaporizer has been suitably heated, the auxiliary vaporizer may be cut off by closing the valve 30. In order to put out the flame of the starting cup, the latter is raised by the handle 25 until it is in line with the air-carrying passages in the auxiliary nozzle 31; the air-controlling valve 36 is then opened and the jet of air under pressure will put out the cup.

I have shown two tanks, one containing air and the other containing fuel; the former may with advantage contain about 250 cubic inches, while the latter may have a capacity of about seven gallons. I do not however limit myself to any specified capacity for either of the tanks. Instead of utilizing separate tanks, one for air and the other for fuel, I may use only a single tank and take therefrom the necessary amount of air to supply the auxiliary nozzle. With systems utilizing fuel under air pressure, it is customary to leave a fairly large air space in the tank, and this space may be placed in direct communication with the auxiliary nozzle, as shown in Fig. 6. In this figure 5 represents the fuel tank containing air under pressure. Fuel is conveyed therefrom to the main vaporizer by the pipe 17. At the upper end of the tank is a pipe 34 which conveys air under pressure to the auxiliary nozzle.

Under ordinary conditions of running, the

auxiliary vaporizer and its nozzle are cut out of circuit, as the main vaporizer is of sufficient capacity to supply the necessary vapor. When however the demand on the boiler for steam is exceptionally heavy the auxiliary vaporizer and its nozzle may be continued in service. The action of the latter can take place without materially decreasing the pressure in the air tank 6.

10 It is of great advantage to have a starting device which depends for its fuel upon that carried in the supply tank, for it thus dispenses with an auxiliary supply of fuel, which may be expensive and is frequently
15 inconvenient to obtain. The starting device illustrated is simple in construction, acts quickly, and will start the burner into operation without smoke or soot, if properly handled. The products of combustion that
20 pass through the auxiliary vaporizer strike the coils of the main vaporizer at or near the nozzle end, and then pass through the boiler, thus tending to warm it. After passing through the boiler the products
25 leave by the regular flues, thereby dispensing with auxiliary discharge pipes. The starting device is connected to the main nozzle and also to the tanks by unions, so that it is a simple matter to remove it for
30 the purpose of cleaning, or otherwise. The vaporizers and nozzles are connected in series relation and all receive fuel from the same source, *i. e.*, the tank or other source of supply 5; it thus becomes a simple matter
35 to start and stop the operation of the system.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention together with the apparatus which I now consider to
40 represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

45 What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In combination, a burner having a mixing chamber, a casing for the burner, a nozzle adjacent the periphery of the burner casing which discharges fuel into said
50 chamber, a main vaporizer arranged above the burner within the casing, an auxiliary vaporizer having a casing secured to the burner casing and opening into it above said burner and adjacent the main vaporizer, a
55 helical coil within the auxiliary vaporizer casing, a starting nozzle axially arranged adjacent the outer end of the coil and connected therewith which discharges its flame
60 along said coil into the interior of the burner casing where it impinges on the main vaporizer, a conduit connecting the discharge end of the main vaporizer with the inlet end of said coil, a branch conduit leading from said conduit to the main burner

nozzle, a valve controlling the flow through said branch, and a valve controlling the flow through the conduit from the main to the auxiliary vaporizer.

2. In combination, a burner, a nozzle for supplying fuel to the burner under service conditions, a starting device for the burner comprising a vaporizer for liquid fuel, a nozzle connected therewith, a permanently inclosing casing, a nozzle closely adjacent
75 but independent of the vaporizer nozzle for delivering a supply of air under pressure to atomize the liquid fuel passing from the vaporizer through its nozzle to form a flame for initially heating said vaporizer, means
80 for shutting off the air supply to stop the atomizing action after the vaporizer has been heated to supply vapor through its nozzle to sustain the starting flame, and a starting cup arranged in the casing for igniting
85 the flame.

3. In combination, a burner, a main vaporizer arranged above the burner, a main nozzle receiving vapor from the vaporizer to heat the burner under service conditions, a starting device for the burner comprising a vaporizing coil for liquid fuel and a nozzle connected therewith which directs its flame over the coil, an inclosure for the vaporizer coil and nozzle which is fixed relative to
95 the burner and the main vaporizer, means closely adjacent the starting nozzle for delivering a jet of air under pressure to atomize the liquid fuel from the nozzle to form a flame for initially heating the starting vaporizer, a valve for shutting off the air supply to stop the atomizing action after the coil has been heated to supply vapor to the starting nozzle to sustain the starting
105 flame, and a starting cup arranged in co-operative relation to the nozzle of the starting device to ignite its flame.

4. In combination, a burner having a number of fuel openings, a main vaporizer comprising a coiled pipe situated above the fuel openings, an inclosing casing for the burner and vaporizer, a nozzle for delivering fuel from the main vaporizer to the burner, an auxiliary vaporizer including a helical coil of piping, a cylindrical casing
115 for the auxiliary vaporizer and its coil which is attached at one end to the burner casing and opens into the region occupied by the main vaporizer, an auxiliary nozzle axially arranged in the outer end of the auxiliary vaporizer casing which directs its flame along the coil into the burner casing and upon the main vaporizer, a conduit connecting the discharge end of the main vaporizer with the inlet end of the auxiliary vaporizer, a valve for controlling the flow from said conduit to the auxiliary vaporizer, a branch conduit leading to the main burner nozzle from a point in said conduit between the end of the main vaporizer and said
130

valve, and a valve for controlling the flow from the auxiliary vaporizer to its nozzle.

5. In combination, a burner having a mixing chamber, a casing for the burner, a nozzle adjacent the periphery of the burner casing which discharges fuel into said chamber, a main vaporizer comprising a pipe coiled above the burner with one end projecting outward through the casing, an auxiliary vaporizer comprising a cylindrical casing attached at one end to the burner casing and opening into the region occupied by the main vaporizer, a helical coil within the auxiliary vaporizer casing, a starting nozzle axially arranged in the outer end of the casing adjacent the coil and connected therewith which discharges its flame along said coil to the interior of the burner casing and upon the main vaporizer, a nozzle structure comprising a vertical member having a conduit connected at its upper end with the projecting end of the main vaporizer coil and at its lower end with the auxiliary vaporizer coil, a horizontal member projecting from the vertical member intermediate its ends and forming the nozzle proper which receives fuel from said conduit and delivers it to the burner, a valve for said nozzle, a valve controlling the flow from the lower end of the conduit to the auxiliary vaporizer, a valve for controlling the flow from the auxiliary vaporizer to the starting nozzle, and an igniting device arranged in the auxiliary vaporizer casing adjacent the end of the starting nozzle.

6. In combination, a burner, a fuel supply working under pressure, a nozzle, a vaporizer which is arranged above the burner and is connected to the said supply at one end and to the nozzle at the other, a starting device for heating the vaporizer which receives fuel from the main source of supply, and means independent of the fuel supply tank for supplying air under pressure to the starting device.

7. In combination, a burner, a fuel tank, a nozzle, a main vaporizer which is adapted to be heated during operation directly by the flame of the burner and is connected at one end to the tank and at the other end to the nozzle, a casing for the burner and vaporizer, an auxiliary vaporizer and nozzle which are connected to and receive fuel from the main vaporizer, a connection for supplying air under pressure to the auxiliary nozzle, and an inclosure for the auxiliary nozzle which opens into the casing and directs the flame therefrom against the main vaporizer.

8. In combination, a burner, a vaporizer which is located in the path of flame of the burner, a fuel tank under air pressure for supplying fuel thereto, a nozzle which is connected to the vaporizer, an auxiliary vaporizer, a nozzle which is connected there-

to, an air tank, a connection between the tank and the auxiliary nozzle, and a connection which receives fuel after it passes the main nozzle opening and delivers it to the auxiliary nozzle.

9. In combination, a burner, a main vaporizer superposed to the burner, a main nozzle for feeding fuel to the burner, a starting device comprising a vaporizer and nozzle, a connection leading from the main vaporizer at a point beyond the main nozzle to the starting device, a tank independent of the fuel supply for supplying air under pressure to the nozzle of said device for the purpose of starting, and a valve for cutting off the air pressure after the system has started into operation.

10. In combination, a burner, a main vaporizer, a nozzle having a fuel opening, a member on the nozzle having a substantially vertical passage connected with said opening, a connection leading from the main vaporizer to the upper end of said passage, an auxiliary vaporizer, a connection leading from said passage at a point below the nozzle opening to the auxiliary vaporizer whereby the accumulation of relatively cold fuel in the main nozzle opening is prevented, and a valve for controlling the flow from said passage to the second connection.

11. In combination, a burner, a main vaporizer, an auxiliary vaporizer for starting purposes, a nozzle, a member on the nozzle provided with a passage which connects the two vaporizers and has a fuel opening in one side which supplies the nozzle, means extending into and across said passage for closing the fuel opening without interrupting the connection between said vaporizers, and a valve for controlling the flow through said passage from the main vaporizer to the auxiliary vaporizer.

12. In a starting device, the combination of a vaporizer, a source of air under pressure, a nozzle having separate fuel and air openings, connections respectively between the fuel and air openings and the vaporizer and source of air supply, a starting cup arranged adjacent to the nozzle for causing ignition of the air and fuel mixture discharged therefrom, means for supporting the starting cup, and means for bringing the starting cup and air openings in juxtaposition for extinguishing the flame of the cup.

13. In combination, a fuel tank under pressure, a vaporizing coil connected with the tank, a main nozzle, a connection between the vaporizing coil and the main nozzle, a valve for said nozzle, an auxiliary vaporizer, a conduit leading from the main vaporizing coil to the auxiliary vaporizer at a point beyond the main nozzle connection, a valve controlling the flow through said conduit, an auxiliary nozzle, a connection between the auxiliary nozzle and its vapor-

izer, the system being so arranged that the vaporizers are in series relation and they and the nozzles receive fuel from the same source, and a valve for controlling the flow through said last named connection to the auxiliary nozzle.

14. In combination, a burner, a main vaporizer adapted to be heated thereby, a casing therefor, a nozzle, an auxiliary vaporizer, an auxiliary nozzle which is connected to both vaporizers, an inclosure which permanently surrounds the auxiliary vaporizer and nozzle and directs the flames from the latter into the casing so that they will heat the main vaporizer, and a source of air under pressure for making an inflammable mixture within the inclosure and driving the flames against the main vaporizer.

15. In combination, a pair of vaporizers connected in series, a nozzle between the discharge end of one vaporizer and the receiving end of the other, a valve therefor, a second or starting nozzle connected to the discharge end of the second vaporizer and located adjacent the first vaporizer which discharges its flame against both vaporizers to heat the fuel therein, a valve therefor, and a valve arranged adjacent the receiving end

of the second vaporizer for controlling the supply of fuel thereto.

16. The combination of a burner, a main vaporizing coil arranged so as to be heated by the flame of the burner, a nozzle for supplying vapor to the burner, a starting device comprising a vaporizing coil connected in series with the main coil and a nozzle for heating both coils, a common source of fuel supply for the vaporizing coils, a source of compressed air connected to the nozzle of said device for atomizing liquid fuel to form a flame for initially heating its vaporizing coil, separate valves for controlling the supply of air and fuel for the starting device, the air valve being used to shut off the air supply when the starting coil has been sufficiently heated to supply vapor to its nozzle, and a starting cup so arranged with respect to the nozzle of said device as to ignite the atomized fuel.

In witness whereof I have hereunto set my hand this twentieth day of January, 1902.

AUGUSTUS A. BALL, JR.

Witnesses:

DUGALD MCK. MCKILLOP,

JOHN J. WALKER.