May 22, 1956 C. C. YOUNG 2,746,530

GAS PILOT ARRANGEMENT FOR BURNER APPARATUS

Filed Aug. 4, 1952 2 Sheets-Sheet 1

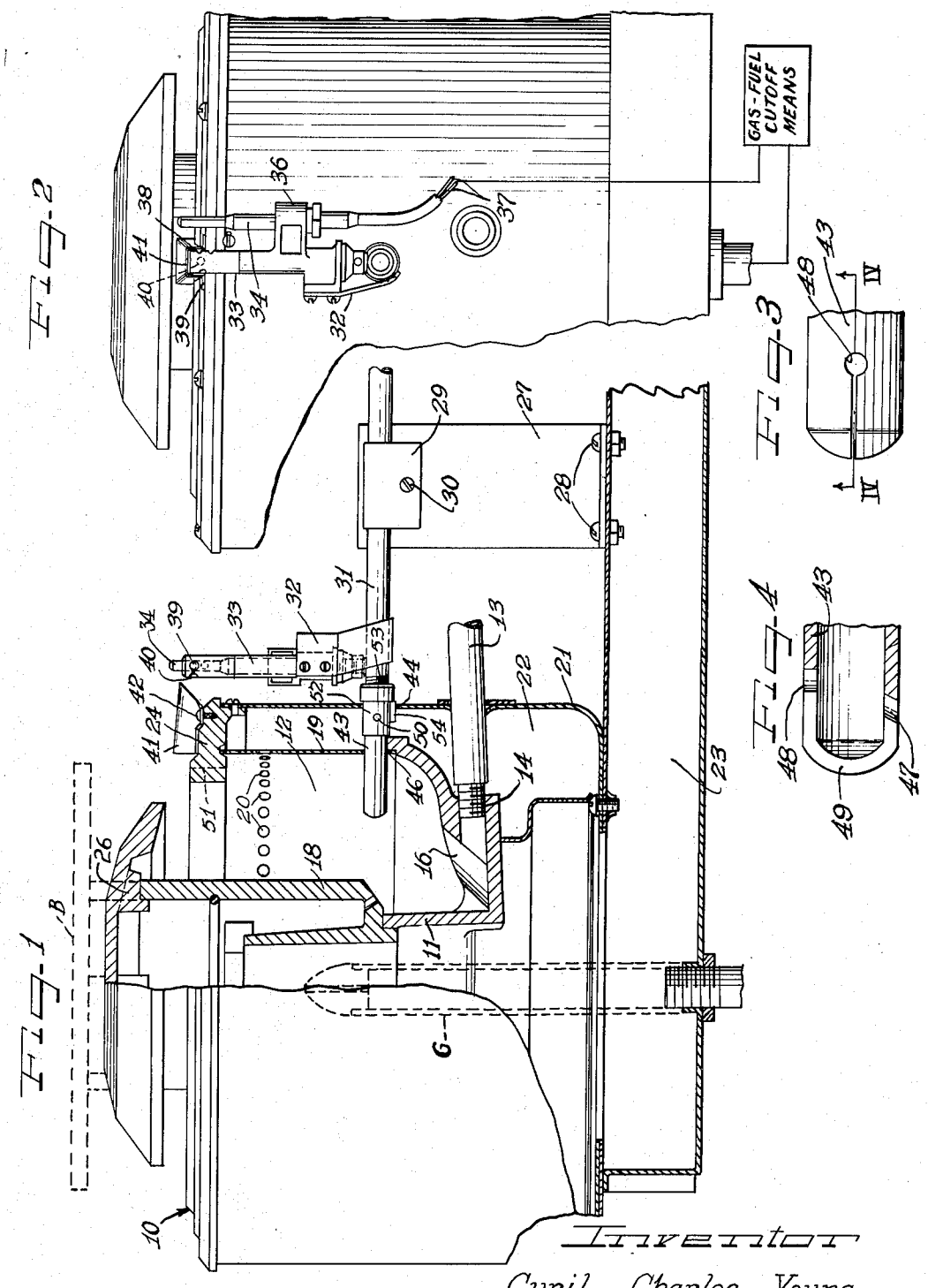

Fig-2

Fig-3

Fig-4

Fig-1

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GAS PILOT ARRANGEMENT FOR BURNER APPARATUS

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Fig. 5

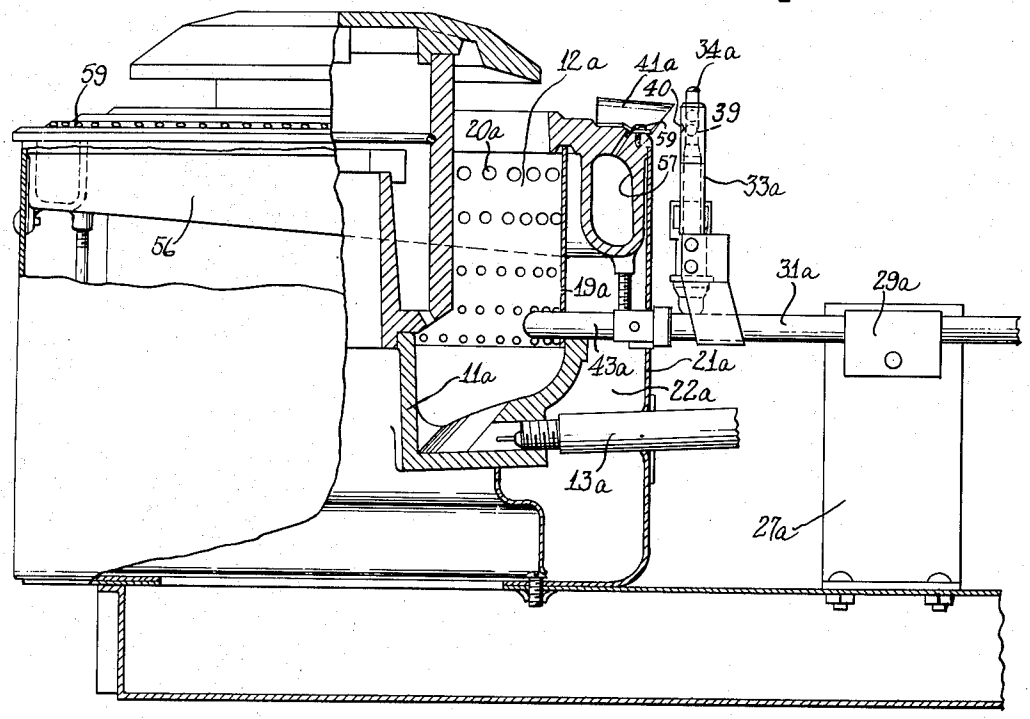
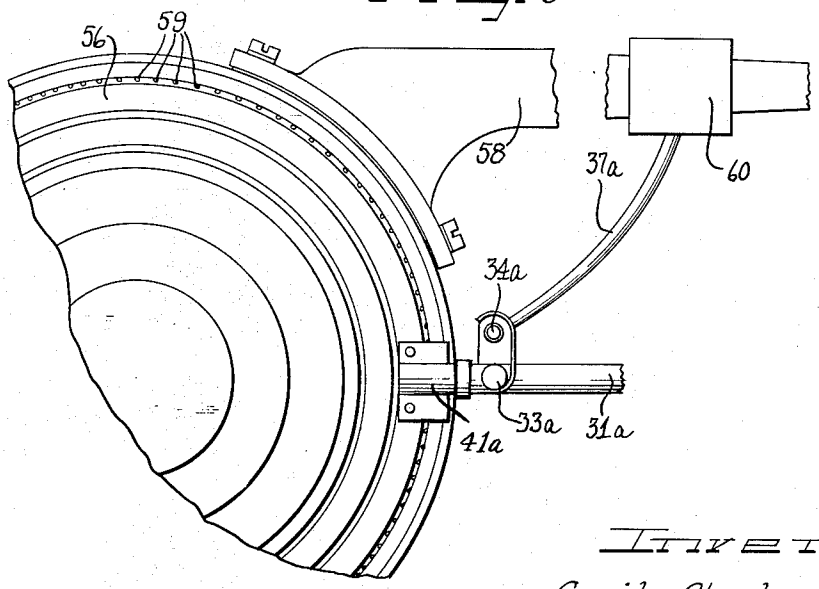


Fig. 6



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GAS PILOT ARRANGEMENT FOR BURNER APPARATUS

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7 Claims. (Cl. 158—11)

This invention relates generally to burner apparatus and more particularly to a gas burner pilot arrangement for a vaporizing type burner unit or to a burner unit which is adapted to burn both gas and oil fuels.

According to the principles of the present invention, a combustion chamber having an oil reservoir has an air chamber adjacent thereto and means are provided between the combustion chamber and the air chamber to diffuse a supply of combustion supporting air thereinto. In the illustrated embodiments of the invention, a combination gas-oil burner utilizing either a center gas port or an annular gas burner unit is provided.

A gas pilot burner apparatus is provided and preferably includes a first pilot burner tube which extends adjacent the air chamber and includes port means to direct a pilot flame into an upper portion of the combustion chamber superjacent the reservoir tray. At this portion of the combustion chamber, an adequate supply of combustion supporting air has been mixed with the vapors arising from the tray and no difficulty is encountered in maintaining the gas pilot burner flame.

A second pilot burner tube is extended through the air chamber and through the walls of the combustion chamber. The second pilot burner tube is provided with port means to direct a pilot flame into a lower portion of the combustion chamber towards the oil reservoir tray. The area surrounding the port means is usually vapor rich and when a heavy quantity of vapors are rising from the tray, this area is likely to be deficient in combustion supporting oxygen.

Inlet means are provided between the air chamber and the second pilot burner tube so that the increased pressures prevailing in the air chamber will result in the supply of an excess of combustion supporting air to the second pilot burner tube. Thus, the gas fuel supplied to the pilot burner tube will be premixed with an excessive proportion of primary air thereby insuring burning of the pilot flame even though an oxygen deficient atmosphere exists in the combustion zone immediately adjacent the supply of oil fuel in the reservoir tray.

The second pilot burner tube is also provided with port means to direct a pilot flame upwardly in the general direction of the port means provided in the first pilot burner tube. This arrangement permits ignition and reignition of the oil burner pilot from the pilot burner tube arranged adjacent the air chamber.

It is an object of the present invention to provide a gas pilot burner arrangement which is easily fabricated from a reduced number of simplified components and which may be readily utilized in burner units of conventional design.

Another object of the present invention is to provide a gas pilot burner arrangement which will be particularly useful in a combination gas-oil burner unit to insure flame stability during the off periods when oil is not being burned.

An additional object of the present invention is to provide a safety pilot outside of the burner heat zone

which is completely accessible for servicing and which will promote burner stability.

A further object of the present invention is to provide a gas pilot burner arrangement which will insure flame stability and complete combustion of pilot gases.

Yet another object of the present invention is to provide a gas pilot burner arrangement which is cooled by an increased volume of gas and air flowing therethrough.

Yet another object of the present invention is to provide a gas pilot burner arrangement which will eliminate the possibility of gas fuel being conducted to the pilot burner being forced back through the conducting means during oil burner operation.

Another object of the invention is to provide a pilot arrangement affording a reignition safety feature.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompanying sheet of drawings showing a preferred structural embodiment of a burner unit including the gas pilot arrangement provided in accordance with the principles of the present invention.

As shown on the drawings:

Figure 1 is an elevational view with parts broken away and with parts shown in cross section showing a burner unit incorporating the gas pilot arrangement of the present invention;

Figure 2 is a fragmentary side elevational view of the unit of Figure 1;

Figure 3 is an enlarged fragmentary view of the port means provided in one of the pilot burner tubes;

Figure 4 is a cross sectional view taken on line IV—IV of Figure 3;

Figure 5 is a view similiar to Figure 1 but illustrating a modified embodiment of the invention; and

Figure 6 is a fragmentary plan view of the structure shown in Figure 5.

On the drawings:

For purposes of illustration, the principles of the present invention are applied to a vaporizing type oil burner indicated generally by the reference numeral **10**.

In the particular embodiment shown by way of illustrative example, an oil reservoir is provided which takes the form of an annular vaporing tray **11** forming the bottom of a vaporizer compartment **12**. A supply of vaporizable fuel such as oil is furnished to the tray through an oil supply line conduit **13** threaded into the tray as at **14** and communicating with a passageway **16** formed in the bottom portion of the tray **11**.

On the inner annular edge of the tray **11** is mounted a hub **18**. The outer annular rim of the tray **11** is provided with a recess seating an annular sleeve **19** perforated as at **20**.

A casing **21** forms together with the sleeve **19** and the tray **11** an annular air chamber **22** which may be supplied with combustion supporting air through a duct **23** communicating with a conventional blower means.

A cap ring **24** is mounted on top of the casing **21** and the sleeve **19** and includes a portion which overlies the combustion chamber **12**.

In the particular structural embodiment used for purposes of illustration, a centrally located baffle **26** is mounted atop the hub **18** and is arranged to deflect the flames in the combustion chamber **12** upwardly and outwardly. It will be understood, of course, that other vaporizing type oil burners may be used which employ an outer baffle ring to direct the oil flames radially inwardly towards the center of the burner unit.

It will also be understood that the burner unit **10** is of

the type readily adaptable for conversion into a combination gas-oil burner since a gas nozzle *g*, as shown in dotted lines, Figure 1 can be arranged to project a jet of gas fuel through the hub **18** and a different type of baffle B, shown in dotted lines, Figure 1 can be employed instead of the baffle **26** so as to act as a target flame spreader in the area superjacent the hub **18**.

A bracket **27** is carried by the duct **23** and is attached in firm assembly therewith by a plurality of fasteners **28**. The bracket **27** has a positioning clip **29** thereon by means of fasteners **30** and a gas supply line **31** extends through the positioning clip towards the burner unit **10**.

A support bracket **32** is carried by the gas supply line **31** and mounts a first gas pilot burner tube **33** adjacent the air chamber **22**.

A thermostatic safety cutoff is associated with the burner tube **33** and includes a thermocouple **34** mounted adjacent the burner tube **33** by means of a bracket **36**. The leads to the thermocouple **34** are indicated at **37** and it will be understood that the thermostatic safety cutoff operates in a conventional manner to operate a cut out means shown diagrammatically and indicated by legend (Figure 2) operating to cut out the gas supply to the burner G in the event the pilot flame is extinguished.

The pilot burner tube **33** is provided with a port **38** arranged to direct a pilot flame against the thermocouple **34**. The tube **33** further includes a port **39** which is arranged to direct a pilot flame laterally to ignite a gas burner which is not utilized in the preferred embodiment herein illustrated. A third port **40** is provided in the burner tube **33** and is arranged to direct a pilot flame through a guide shield **41** mounted in firm assembly with the cap ring **24** by a plurality of fasteners **42** to a location generally superjacent the combustion chamber **12**.

In accordance with the principles of the present invention, a second gas pilot burner tube **43** is connected to the gas supply line **31** and extends through an aperture **44** formed in the casing **21**, through the air chamber **22** and through an aperture **46** formed in the sleeve **19**. The end of the pilot burner tube **43** extends into the combustion chamber **12** and is located immediately adjacent the supply of oil contained in the vaporizer tray **11**.

The burner tube **43** is provided with a port **47** arranged to direct a pilot flame downwardly into a lower portion of the combustion chamber and towards the supply of oil fuel in the vaporizer tray **11**. The tube **43** is further provided with a port **48** arranged to direct a pilot flame into an upper portion of the combustion chamber **12** in the general direction of the pilot flame emanating from the port **40** of the first pilot burner tube **33**. Port means are also provided in the end of the tube **43** between the ports **47** and **48** to direct a fan shaped pilot flame into the combustion zone immediately adjacent the supply of fuel in the vaporizer tray **11**. In the particular embodiment shown, the last mentioned port means takes the form of a narrow slot **49** which extends between the ports **47** and **48**, however, it will be understood that a plurality of aligned apertures could also be effectively provided.

When oil is being burned, the ports **47**, **48** and **49** of the pilot burner tube **43** are located in an atmosphere deficient in air for combustion since most of the air for combustion in the vaporizing type burner unit **10** is introduced into the combustion chamber **12** near the top of the perforated sleeve **19**. Under such conditions, there is insufficient secondary air surrounding the pilot burner tube **43** to support complete combustion of the gas fuel supplied to the pilot burner tube **43**.

In order to provide sufficient air to burn the pilot gas under such conditions, the present invention contemplates the location of a primary air intake means **50** on the burner tube **43** within the air chamber **22**. Since the air chamber **22** is normally pressurized by a fan or a conventional blower means during the oil burning cycle, the amount of primary air passing through the air intake means **50** and mixing with the pilot gas supply is greatly increased to the extent that approximately 100% primary air is introduced with the gas. The amount of air is sufficient to supply combustion of the pilot gas in an oxygen deficient atmosphere.

The pilot gas premixed with an excess supply of primary air will burn in the oxygen deficient atmosphere since no secondary air will be required in the combustion zone immediately adjacent the supply of oil in the vaporizer tray **11**.

The cap ring **24** of the exemplary design herein described is preferably notched as at **51** at a location in registry with the port **48** of the burner tube **43** and the flame emanating from the port **40** of the burner tube **33**. Thus, under normal operating conditions, the pilot burner tube **33** and the pilot burner tube **43** will operate to ignite or reignite one another. The structure provided thus affords a safe method of igniting a vaporizing type oil burner since the pilot burner tube **33** operates as a safety pilot outside of the heat zone of the oil burner and yet incorporates into the burner unit the basic safety elements which are required for successful operation.

If the pilot arrangement described is utilized with a combination gas-oil burner unit, the main gas burner is ignited from a safety pilot of conventional design, yet, the advantageous arrangement afforded by the intersection of the jets from the gas pilot burner tube **43** and the gas pilot burner tube **33** insures that reignition of one of the pilot flames will eliminate the danger of an accumulation of unburned gases.

It may be noted that the air intake means **50** for the pilot burner tube **43** can conveniently comprise an apertured sleeve **52**. It will be understood that the area of the ports may be made adjustable if desired, for example, through the provision of an additional sleeve (not shown) cooperating with the sleeve **52**. The tube **43** is threaded as at **53** and a positioning guide **54** is provided between the casing and the tube **43** to firmly support the tube **43** in assembly with the burner unit **10**. In order to remove the pilot apparatus, the clip **29** is loosened and the entire gas pilot supply line **31** may be retracted.

If the air chamber **22** is at normal atmospheric pressure, it will be understood that primary air for the burner tube **43** is induced through the air intake means **50** by the gas flow through the gas supply line **31**.

In the embodiment of Figures 5 and 6, the oil reservoir comprises a vaporizer tray **11*a*** having a combustion chamber **12*a*** adjacent thereto. A supply of vaporizable fuel, such as oil, is furnished to the tray through an oil supply conduit **13*a***. An outer casing **21*a*** surrounds the burner unit and an inner sleeve **19*a*** is provided above the vaporizer tray **11*a*** so that an air chamber **22*a*** is provided adjacent the combustion chamber **12*a*** having a flame port or opening at the upper portion thereof.

The inner sleeve **19*a*** is provided with spaced rows of different sized apertures **20*a***, the apertures being of small size at the bottom of the sleeve and increasing in size toward the upper end of the sleeve. Combustion supporting air from the air chamber **22*a*** passes into the combustion chamber **12*a*** through the apertures **20*a***.

Supported on the outer casing **21*a*** and the inner sleeve **19*a*** is a casting forming an annular gas burner **56**. The annular gas burner **56** has a hollow passageway **57** which receives a supply of gaseous fuel from a gas duct **58** connected therewith. The annular hollow passageway **57** varies in cross sectional area so that a uniform supply of gas will be furnished from the duct **58** throughout the entire passageway **57** to a plurality of gas jets **59** arranged in an annular row.

The structure shown in the embodiment of Figure 5 includes a bracket **27*a*** supporting a positioning clip **29*a*** through which extends a gas supply line **31*a*** having a pair of pilot burners on the end thereof.

A first gas pilot burner tube **33*a*** is arranged adjacent the outside casing **21*a*** and exteriorly of the combustion

chamber 12a. A second gas pilot burner tube 43a extends at right angles to the first gas burner tube 33a and projects into the combustion chamber 12a. The gas pilot burner tubes 33a and 43a are constructed identically with the gas pilot burner tubes 33 and 43 described above and are arranged to direct flames toward the flame port of the combustion chamber which serves as a common objective so that the pilots will ignite and reignite one another. In other words, the first gas pilot burner tube 33a is arranged to direct a pilot flame adjacent the gas burner 56 as well as into and toward the combustion chamber 12a and the second gas pilot burner tube 43a extending into the combustion chamber 12a not only projects a flame toward the fuel and vaporizer tray 11a, but also projects a flame upwardly towards the flame port so that the two gas pilot burner tubes 33a and 43a will tend to ignite and reignite one another.

A flame carrier 41a is mounted on top of the casting 56 and assists in directing the flame from the first gas pilot burner tube 33a toward the flame port of the combustion chamber 12a. It will be noted that the gas jets 59 are ignited by the flame emanating from the first gas pilot burner tube 33a.

Cutoff means are indicated at 60 and function to cut off the supply of gas to the gas burner whenever a thermal unit 34a arranged adjacent the first gas pilot burner tube 33a outside of the combustion chamber 12a is no longer heated by the first gas burner tube 33a. Thus, the apparatus of the present invention affords a very desirable safety feature since the thermal element 34a is located outside of the heat zone in a completely accessible position affording ready serviceability.

Although various minor structural modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. Burner apparatus comprising, an annular vaporizer tray having an upstanding perforated side wall, means to supply oil fuel to said tray, means forming an annular air chamber around said tray, means providing combustion supporting air to said air chamber for diffusion through said wall, and a gas pilot assembly including a first burner tube adjacent said air chamber, a second burner tube extending horizontally through said air chamber and said side wall, said second burner tube having air inlet means in said air chamber, said burner tubes formed to direct jets of flame into adjacently spaced regions above said tray, said second burner tube having a first port to direct a pilot flame downwardly towards the oil fuel in the bottom of the tray and a second port to direct a pilot flame upwardly towards the top of said side wall, said first burner tube having a port to direct a pilot flame into an area superjacent said tray and in the general direction of the flame emanating from the second port of said second burner tube, whereby said first and second burner tubes will ignite and reignite one another.

2. A burner apparatus as defined in claim 1, said second burner tube having port means between said first and second ports to direct a fan shaped pilot flame over said tray.

3. Burner apparatus comprising, an annular oil tray, means to supply fuel oil to said tray, a perforated annular sleeve mounted on the outer edge of said tray, means forming together with said tray and said sleeve an annular air chamber adjacent said tray, means to supply air to said chamber for diffused flow through said sleeve for supporting the combustion of fuel in said tray, and a gas supply line having a first pilot adjacent said air chamber and a second pilot extending through said air chamber and through said sleeve, said first pilot having means to direct a pilot flame into an area superjacent said tray to ignite vapors arising therefrom, and said second pilot having an air intake means in said air chamber, said second pilot also having means to direct a pilot flame into an area superjacent said tray to heat and ignite fuel oil in the tray, said first and second pilots arranged to direct a flame into a common area thereby to ignite and reignite one another, said second pilot receiving during operation of the oil burner all of its combustion supporting air through said air intake means in said air chamber.

4. A combination gas-oil burner comprising a burner unit having a combustion chamber, means including a vaporizer tray for selectively burning oil fuel in said combustion chamber, gas burning means including a gas nozzle for selectively burning a gas fuel, a first pilot outside of said combustion chamber directing a flame toward a region proximate the nozzle of the gas burning means to ignite the gas fuel, a second pilot extending into said combustion chamber and directing a flame towards a region proximate said tray of said oil burning means to heat and ignite the oil fuel in the tray, means providing a fuel gas supply connected to said gas burning means and including cutoff means in control of the gas fuel supply having a safety thermal actuating element adjacent said first pilot outside of said combustion chamber to cut off the gas fuel supply whenever said first pilot is extinguished, said pilots each having means directing a flame towards a common point to ignite and reignite one another.

5. In a burner unit, a vaporizer tray, means providing a supply of fuel to said tray, means providing a combustion chamber adjacent said tray, gas burning means including a main gas burner adapted to burn combustible gas, and a pilot arrangement consisting of a first pilot extending adjacent to and outside of said combustion chamber arranged to ignite the gas fuel emanating from said gas burning means, and a second pilot extending into said combustion chamber and arranged to heat and ignite the fuel in said tray, both of said pilots having means directing a pilot flame toward a common point in said combustion chamber and operating to ignite and reignite one another, and means providing a source of gas fuel for said main gas burner controlled by fuel cutoff means and including a thermal control element outside of said combustion chamber arranged to be heated by said first pilot and adapted to operate said fuel cutoff means to cut off the supply of gas fuel to said main gas burner whenever said pilot is extinguished.

6. A burner unit comprising means formed to provide a combustion chamber having a flame port and a pilot burner having a first pilot adjacent to and outside of said combustion chamber and directing a flame towards a region adjacent said flame port of said combustion chamber to ignite vapors in the area of said flame port, and a second pilot projecting into said chamber and directing a flame towards a region inside of said combustion chamber to heat and ignite fuel in the bottom of said combustion chamber, said second pilot having means directing a flame towards a region adjacent said flame port for igniting said first pilot and for being reignited by said first pilot, means providing a combustible fuel including a main gas burner and having cutoff control means including a thermal element outside of said combustion chamber heated by said first pilot to cut off the supply of fuel to said main gas burner whenever said first pilot is extinguished.

7. A combination gas-oil burner comprising, a source of gas fuel supply, a main gas burner connected thereto and arranged to direct a gas flame upwardly, an oil burner tray having a bottom adapted to receive oil fuel from which combustible oil vapors rise upwardly, and a constant burner pilot assembly comprising a first pilot burner tube connected to said gas fuel supply and direct-

ing a jet flame toward a region above the gas burner unit to ignite the gas fuel, a second pilot burner tube connected to said gas fuel supply and directing a jet flame against the fuel oil to heat and ignite the oil fuel, and means provided on each of said pilot burner tubes to direct a flame towards a point of intersection thereby to ignite and reignite each other.

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