

March 17, 1970

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GAS BURNER APPARATUS

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2 Sheets-Sheet 1

FIG. 1.

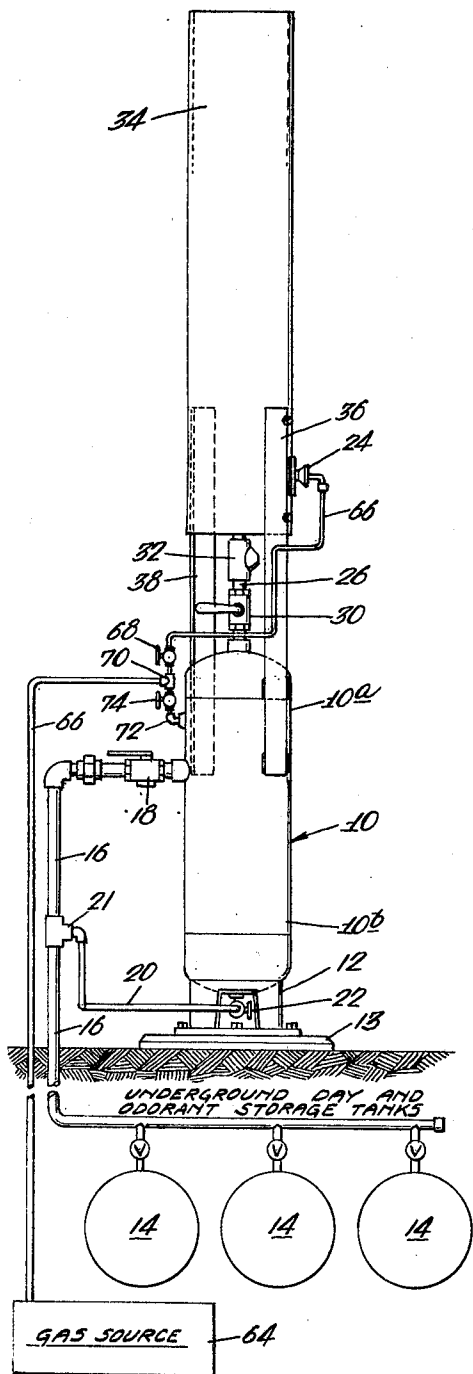
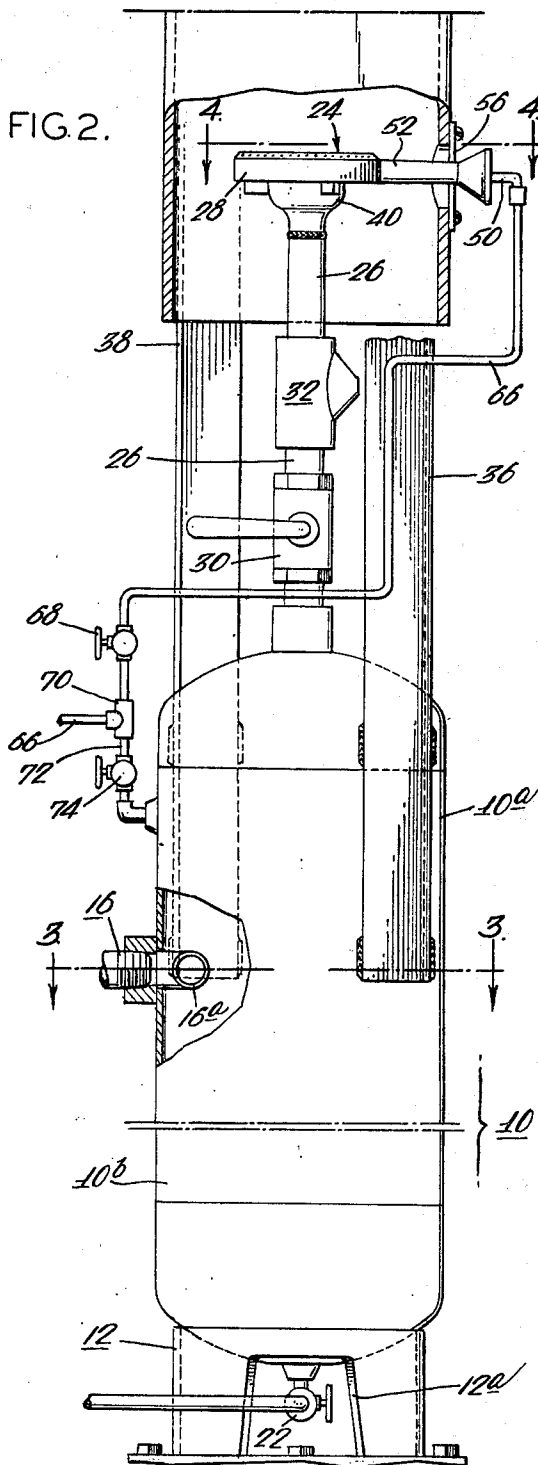


FIG. 2.



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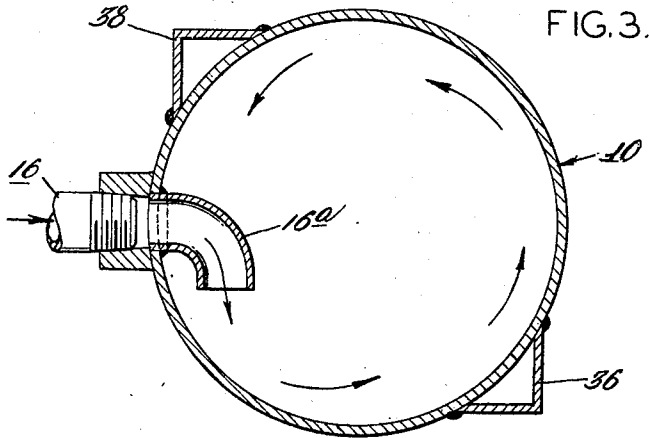
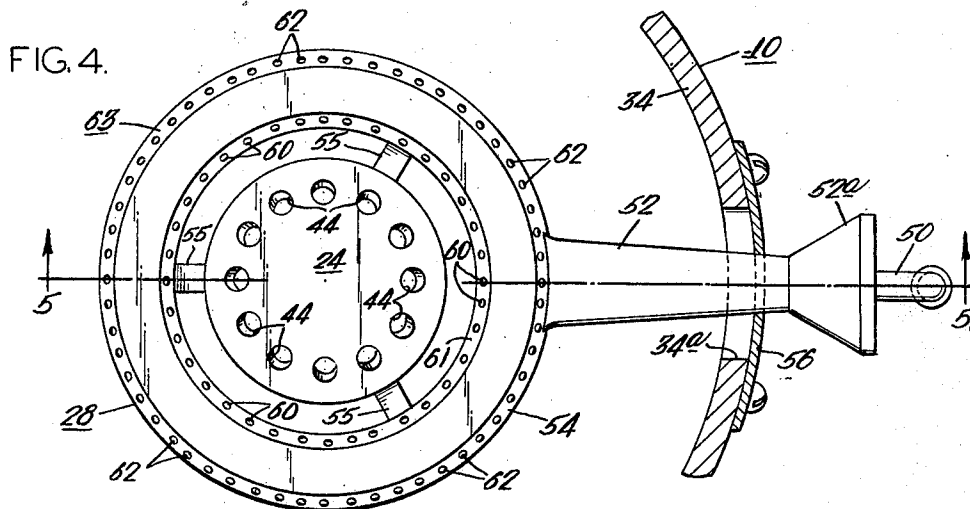
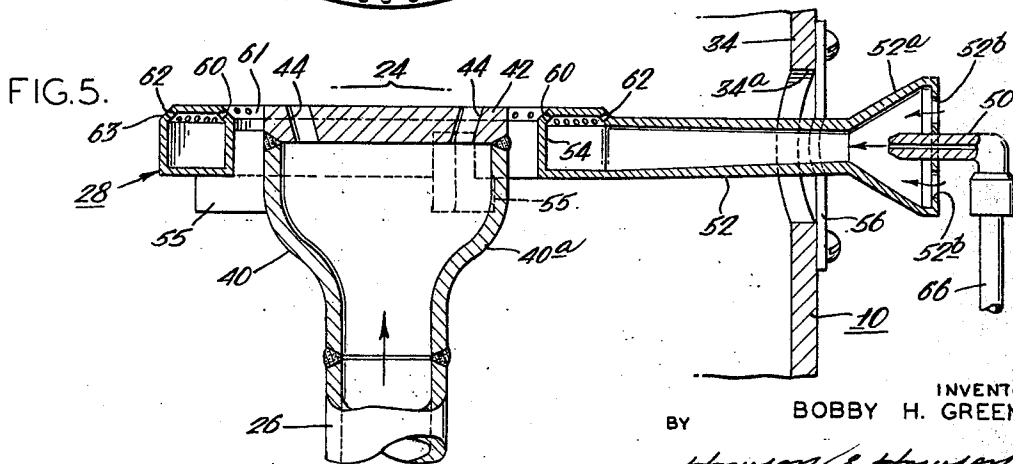
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GAS BURNER APPARATUS

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28 Claims

ABSTRACT OF THE DISCLOSURE

A gas burner apparatus is provided which includes a vessel having an upper portion and a lower portion and first conduit means for introduced gas into the upper portion of the vessel to provide a swirling motion of the gas in the chamber. A burner head is employed having a plurality of ports for directing gas outwardly from the burner head. The apparatus includes a tubular burner chamber having a sidewall surrounding the burner head and supported to provide a space between the burner head and the chamber, the chamber extending above the burner head and being open at its ends to permit flow of air through the chamber. The ports of the burner head are adapted to direct gas into the chamber for creating a turbulence to draw air into the chamber. Second conduit means including valve means is provided for venting gas upwardly from the vessel to the burner head and third conduit means is provided for permitting withdrawal of liquid from the lower portion of the vessel.

The present invention relates to a gas burner apparatus, and, more particularly, to a gas burner apparatus having improved means for separating gas and liquid constituents and having an improved flare gas burning arrangement.

The present invention is primarily concerned with flare stack gas burners which are used to dispose of gas-odorant mixtures at stations where odorant is added to the gas. In transcontinental gas pipe line systems, the gas moves under pressure to stations for use by cities. Since natural gas has no odor, an odorant is added to the gas at stations prior to supplying the gas to the ultimate consumer to provide an odor for detection of the gas. The gas is channeled from the main gas pipe line, fed through a gas-odorant storage tank or tanks and pumped into a gas line for use by the consumer. The gas-odorant storage tanks in which the odorant is added to the gas are refilled with odorant from main odorant storage tanks located nearby to maintain the proper odorant level in the gas. When it is desired to refill the gas-odorant storage tanks, which may be referred to as day storage tanks, the gas pressure in the tank must be relieved. The relief of the gas-odorant mixture from the day storage tanks is through a flare to dispose of the mixture, since, if the gas-odorant mixture was vented to the atmosphere, the odor would cause alarm in the surrounding area. The odorant added to the gas is generally a sulphur compound in a liquid form of the type which is volatile to permit suspension of the liquid odorant in the gas. Whenever odorant is desired to be added to either the day storage tanks or to the main odorant storage tanks, the gas in these tanks must be vented and disposed of so that the pressure in the tanks is decreased to permit more odorant to be added to the tanks for maintaining the gas at the desired odorant level.

In the prior art, the flare burners employed for burning the gas from the gas-odorant storage tanks have not been satisfactory. Such flare burners have employed flare stacks in order to have the combustion components vented in the atmosphere at elevations above ground level and to provide a chamber in which burning may take place, since wind currents tend to extinguish the burning of the gas by burners which are not shielded. The prior art flare burners have been very slow in burning and disposing of

2

the desired quantities of gas-odorant mixture, mainly because the burners have not had sufficient air to mix with the gas-odorant mixture to make good combustion. Furthermore, the lack of sufficient air for proper combustion has caused black smoke and permitted odorant to be vented to the atmosphere providing an annoyance of smoke and odor in the vicinity. Also, the prior art flare burners have not been provided with adequate means for separating the liquid odorant from the gas before reaching the burner head, so that quantities of liquid odorant are spurted from the burner, either extinguishing the flame or spewing burning liquid odorant onto the flare and ground. Furthermore, with the slow burning rate of prior art flare burners, the odorant storage tanks cannot be depressurized as rapidly as desired and the depressurizing time for the tanks is regulated by the flare burning time. Therefore, many hours are spent burning gas from the gas-odorant storage tanks before more odorant can be added to the tanks.

Accordingly, it is desirable to provide a flare gas burner apparatus which is capable of providing rapid burning of gas. It is also desirable to provide such an apparatus which is capable of separating liquid odorant from the gas prior to burning, provide a place to store the odorant which is separated and provide a means for returning the liquid odorant which is separated to the underground storage tanks without exposing it to the atmosphere. It is also desirable to provide a gas burner arrangement with means for drawing sufficient air into the burner chamber for full and complete combustion of the gas which is vented at the burner.

In accordance with the gas burner apparatus of the present invention, there is provided a vessel having an upper portion and a lower portion and first conduit means for introducing gas into the upper portion of the vessel. A burner head is employed having a plurality of ports for directing gas outwardly from the burner head. A tubular burner chamber is provided having sidewalls surrounding the burner head and supported to provide a space between the burner head and the chamber, the chamber extending above the burner head and being open at its ends to permit flow of air through the chamber. The ports of the burner head are adapted to direct gas at an angle to the sidewall of the chamber to cause a turbulence to draw air into the chamber. The apparatus further includes second conduit means having valve means for venting gas upwardly from the vessel to the burner head and third conduit means for permitting withdrawal of liquid from the lower portion of the vessel.

In the preferred arrangement of use of the gas burner apparatus, the first conduit means connects the upper portion of the vessel with a gas-odorant system and the third conduit means connects the lower portion of the vessel with the gas-odorant system for returning liquid odorant separated from the gas back to the gas-odorant system. The first and second conduit means each has valve means for proper regulation of gas and liquid flow in the system. Preferably, the first conduit means directs the gas-odorant mixture from the gas system around the sidewall of the vessel in its upper portion to cause a swirling motion of the gas in the vessel for separation of liquid odorant from the gas. Also, the valve means of the second conduit means is positioned above the vessel and provides further separation of liquid odorant from the gas before the gas is vented to the burner head for combustion.

The burner head arrangement is preferably such that the ports of the burner direct gas upwardly and outwardly toward the sidewall of the chamber for causing a turbulence to draw air upwardly into the chamber for rapid and complete combustion of the gas at the burner head. In the preferred form of the invention, a pilot burner is

3

disposed in the tubular chamber and has a pilot head with a plurality of gas outlets for directing gas toward the flow of gas from the ports of the burner head. Preferably, the ports of the burner head are arranged in an annular array around the burner head and the pilot head is disposed around the burner head. In accordance with the invention, the pilot burner head includes another plurality of gas outlets for directing gas upwardly in the tubular chamber and toward the sidewall of the chamber for causing an additional turbulence to draw air upwardly into the chamber for more rapid and complete combustion. In the preferred arrangement of the present invention, the vessel is positioned directly under the burner head with the valve means of the second conduit means positioned directly above the burner, so that any liquid odorant separated from the gas at the valve means drains into the vessel and collects in its lower portion. The liquid odorant collected in the lower portion of the vessel can then be discharged back into the gas systems through the third conduit means at an appropriate time without waste of the liquid odorant.

For a better understanding of these and other features and advantages of the present invention, reference is made to the following detailed description and the accompanying drawings, in which:

FIG. 1 is an elevational view, partly schematic, of the gas burner apparatus in accordance with the present invention;

FIG. 2 is an enlarged side elevational view similar to FIG. 1 with parts broken away and with parts foreshortened;

FIG. 3 is a transverse sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a plan view with parts broken away showing the burner head and pilot burner arrangement taken along line 4—4 of FIG. 2; and

FIG. 5 is a vertical sectional view taken along line 5—5 of FIG. 4.

The gas burner apparatus of the present invention, although useful in a wide variety of applications for separation of substances from gas and then disposing of the gas by burning, is shown and described in relation to disposal of gas having liquid odorant suspended therein. The gas and liquid odorant mixtures are released in depressurizing of gas-odorant storage tanks. The gas-odorant storage tanks may be part of a pressurized gas system which includes gas-odorant storage tanks in which liquid odorant is added to the gas, hereinafter called day storage tanks, and odorant storage tanks in which odorant is kept for supplying the day storage tanks with odorant. When the odorant level in the day storage tanks drops below a predetermined desired level, it is necessary to depressurize the tank, venting the gas-odorant mixture from the tank, to permit a volume of liquid odorant to be added to the day storage tanks for suspension in the gas. Furthermore, when odorant is added to the odorant storage tanks, which tanks are pressurized by gas from the gas system, it is necessary to depressurize the odorant tanks of gas therein before further odorant can be added to the odorant storage tanks. The gas containing odorant vented from the day and odorant storage tanks may be disposed of through the gas burner apparatus of the present invention.

Referring now to the drawings, FIG. 1 shows an overall embodiment of the gas burner apparatus of the present invention designed to separate liquid odorant from gas and provide a place to store the odorant which is separated. In addition, the apparatus provides a way to return the odorant to the gas-odorant storage tanks without exposing the odorant to the atmosphere, and provides a burner arrangement to dispose of the gas. The gas burner apparatus shown in FIGS. 1 and 2 includes a separator vessel or tank generally designated 10 having a support base 12 mounted on a foundation 13 by any suitable means. The separator vessel 10 includes a first por-

4

tion 10a, hereinafter referred to as the upper portion, and a second portion 10b, hereinafter referred to as the lower portion, in which liquid odorant is accumulated after being separated from a gas-odorant mixture introduced into the upper portion of the vessel.

Gas containing liquid odorant suspended therein is vented from underground day and odorant storage tanks generally designated 14 through conduit or pipe 16 and is passed into upper portion 10a of vessel 10. Conduit 16 contains a manually operable valve 18, which may be provided by any suitable valve means, located in conduit 16 adjacent the vessel for convenience. A conduit or pipe 20 is connected from a junction 21 in conduit 16 to the bottom of lower portion 10b of the vessel for passing liquid odorant from the vessel through conduits 20 and 16 and back to the underground day or odorant storage tanks 14. The conduit 20 contains a manually operable valve 22 under the vessel and the valve is shown positioned in base 12, which has an access opening 12a to permit passage of conduit 20 there through. The junction 21 is provided in conduit 16 between the valve 18 and the storage tanks 14 so that conduit 16 can be closed by valve 18 between the junction and vessel, when it is desired to empty the liquid from the vessel back to the storage tanks.

As shown particularly in FIGS. 2 and 3, the conduit 16 terminates in vessel 10 with its end portion 16a extending a distance adjacent the sidewall of the vessel to introduce gas horizontally along the sidewall of the vessel in its upper portion. More specifically, the end portion 16a of conduit 16 introduces the gas into the vessel generally tangentially to the sidewall of the vessel to impart a swirling motion to the gas-odorant mixture in the separator vessel to precipitate liquid odorant from the gas. Any liquid separated from the gas in the vessel is collected in the bottom portion 10b of the vessel and the gas is vented from the vessel to a gas burner head 24 through conduit or pipe 26 connected between the top of the upper portion of the vessel and the burner head. Gas which is expelled from the burner head 24 is ignited by a pilot burner generally designated 28 disposed near the gas burner.

Conduit 26 extends directly upwardly from the top of vessel 10 to the burner head and contains a manually operable valve 30 for relieving pressure from the gas supplied to the vessel and a check valve 32 positioned in the conduit between the valve 30 and burner head for preventing air from passing from the burner head to the vessel. Gas in the underground storage tanks may be pressurized, for example, to a pressure of 28 lbs. p.s.i., and is vented at that pressure to the vessel 10 through conduit 16. The pressurized gas containing odorant has the odorant separated therefrom in the separator vessel and the gas passes into conduit 26. The gas is relieved from its superatmospheric pressure to atmospheric pressure at valve 30 for being burned at the burner head.

The gas at superatmospheric pressure passing from the vessel through the valve 30 may contain some liquid odorant. The gas is expanded at valve 30 and is thereby decreased in temperature, caused by the natural refrigeration effect. This condition precipitates further liquid odorant from the gas at valve 30 in conduit 26 and the separated liquid odorant drains back into the vessel through conduit 26 for collection in the lower portion of the vessel. The gas burner apparatus of the present invention has the valve arrangement in conduit 26 positioned directly above and in close proximity to the vessel so that the liquid odorant separated at the valve may drain conveniently and directly into the vessel for collection, preventing the odorant from collecting in a line to the burner head and being spurted out of the burner head with the gas. Thus, in the present apparatus two places for separating the liquid odorant from the gas are provided, one in the separator vessel and the other at valve

30, to insure more complete separation of the odorant from the gas prior to disposal of the gas.

The burner head 24 is located in a lower portion of a tubular burner chamber or stack 34, which is supported above the vessel 10 by brackets 36 and 38, as shown in FIGS. 1 and 2. The brackets are welded to opposite sides of the vessel and are fastened to opposite sides of the chamber 34, as by screws. The tubular burner chamber is shown extending a substantial distance above the burner head to shield the burner from wind currents and vent combustion products from the burner at a distance above the ground. The tubular chamber 34 is open at its lower and upper ends to permit flow of air through the chamber for mixing with the gas in combustion.

Burner head 24 is provided at the end of conduit 26 and includes a fitting 40 having an increased diameter portion 40a terminated in a plate 42, which is secured to the end of the increased diameter portion of the fitting, as by welding, as shown in FIGS. 4 and 5. The burner head plate 42 is provided with a plurality of ports or openings 44 which provide outlets for the gas at the burner head. The ports of the burner head are angularly positioned or oriented with respect to a vertical orientation through plate 42 for directing gas outwardly and toward the sidewall of tubular chamber 34 at an angle to the sidewall. In the present instance, the ports are at a twenty degree angle to the vertical and direct gas at a twenty degree angle to the sidewall of the chamber. The ports are arranged in an annular array around the burner head plate. The angular arrangement of the ports directs the gas toward the sidewall of the chamber to cause a turbulence or draft to draw air upwardly into the chamber through its bottom opening to mix with the gas around all sides of the burner head to enable rapid and complete combustion of the gas.

The burner head and port arrangement in the chamber facilitates a sufficient air-gas mixture for complete combustion of the gas and any remaining odorant therein, without causing a black smoke or noxious odor. The gas from the burner head directed toward the sidewall of the chamber at an angle to the sidewall provides a draft for drawing sufficient air into the chamber for complete combustion of the gas mixture at any rate of burning desired, which has not been provided in the prior art.

The pilot burner 28 has a pilot burner head with a first plurality of gas outlets for directing gas toward the flow of gas from the ports of the burner head and a second plurality of gas outlets for directing gas toward the sidewall of the chamber. More specifically, as shown in FIGS. 4 and 5, the pilot burner includes a gas nozzle 50, which is supplied with gas from a gas source as will be explained hereinafter. The nozzle 50 directs gas into conduit 52, which has a flared end 52a through the end of which nozzle 50 extends. Flared end 52a also has openings 52b for permitting fresh air to mix with the gas from the nozzle. Conduit 52 at its other end terminates in a pilot gas burner head 54, which is annular in form and is disposed around and adjacent to burner head 24 as shown in FIGS. 4 and 5. The annular pilot burner head is supported by braces 55 fixed between the burner head 24 and the pilot burner head 54 so that the pilot head surrounds the burner head. The pilot burner conduit 52 extends through an opening 34a in tubular chamber 34, the opening being sealed by a split plate 56 fastened to the chamber, as by screws.

The annular pilot burner head is provided with a first plurality of gas outlets 60 in a beveled annular surface 61 adjacent the inside of the pilot head for directing gas upwardly and inwardly toward the flow of gas from the ports of the burner head. With the outlets 60 provided in an annular ring around the burner head, the gas from the pilot burner outlets 60 may be ignited to provide a flame to ignite whatever gas escaped from the ports of burner head 24. The pilot burner head is also provided with a second plurality of gas outlets 62 in a second

beveled surface 63 adjacent the outside of the pilot head for directing gas upwardly and outwardly toward the sidewall of the tubular chamber at an angle to the sidewall for causing a turbulence or draft to draw air upwardly into the chamber. The gas from outlets 62 of pilot head 28 provides a constant gas turbulence in the chamber to draw air into the chamber for complete combustion of the gas from the burner head 24 for whatever quantity of gas is escaping from the burner head.

Gas is supplied to the pilot burner preferably from a constant gas source generally designated 64, shown located beneath the ground in FIG. 1. The gas for the pilot burner may be supplied from the main gas pipe line, which supplies gas to the day and odorant storage tanks or may be provided by any suitable constant gas source. The gas from gas source 64 is supplied through conduit or pipe 66 to nozzle 50 of the pilot burner. Conduit 66 has a manually operable valve 68 for opening and closing the gas line to the pilot burner. The gas supplied to the pilot burner is preferably from a constant gas source so that the gas escaping at the pilot burner will provide a good flame for igniting the gas from the burner head 24. Furthermore, the plurality of gas outlets 62, which are arranged in an annular array around the outer peripheral portion of the pilot head 28, provide passages for escape of gas upwardly and toward the sidewall of the chamber for causing a constant draft to draw air upwardly into the chamber for complete combustion of the gas from the burner head 24. Of course, the gas from outlets 62 is also ignited but it still provides the necessary draft for drawing sufficient air into the chamber for complete combustion of all the gas.

If the amount of gas escaping from gas burner head 24 to be ignited decreases, as the day and/or odorant storage tank or tanks is close to being depressurized, the gas outlets of the pilot burner 62 still provide a turbulence in the chamber to draw air upwardly into the chamber to assure complete combustion of whatever gas may be escaping from burner head 24. Of course, if the amount of gas escaping from the burner head through ports 44 is great, the gas escaping from the ports will provide a greater turbulence for drawing air upwardly into the chamber for complete combustion of the gas escaping from the burner head. By this arrangement it is assured that a sufficient quantity of air is drawn into the chamber for complete combustion in the chamber of gas or gas-odorant mixture escaping from the burner head so as to prevent dark smoke and odor.

After the day and/or odorant storage tanks have been depressurized so that liquid odorant can be added to the tanks, the liquid odorant collected in the separator vessel 10 may be returned to the day or odorant storage tanks in accordance with the present apparatus. In this operation, the valve 30 in conduit 26 between the vessel and burner head should be closed, as well as valve 18 in conduit 16 between the storage tanks and vessel and valve 68 in conduit 66 between the gas source and pilot burner. In order to pressurize the vessel to force the liquid odorant from the vessel, the pilot gas conduit 66 to the pilot burner is provided with a junction 70 and a conduit or pipe 72 leads from junction 70 to upper portion 10a of the vessel, as shown in FIGS. 1 and 2. The junction 70 is located between the gas source 64 and valve 68 in conduit 66, so that valve 68 can shut off gas to the pilot burner without shutting off gas from the gas source to the vessel.

The conduit 72 is provided with a manual control valve 74 for opening and closing the conduit 72. In the arrangement for emptying the liquid odorant from the vessel back to the storage tanks, the valve 74 should be opened to permit flow of gas from the gas source through conduits 66 and 72 into the upper portion of the vessel. The valve 22 in conduit 20 from the bottom of the vessel to conduit 16 should be opened so that the liquid odorant may be forced from the vessel through the conduits 20 and 16 back to the underground storage tanks. After the liquid odorant

has been forced from the vessel to the storage tanks, valve 22 in line 20 should be closed, as well as valve 74 in line 72. In pressurizing the separator vessel with gas from the gas source to discharge the liquid odorant from the lower portion of the vessel back to the storage tanks, it is desirable to have the gas from the gas source be at a pressure equal to or greater than the pressure of the gas in the day and odorant storage tanks to assure proper discharge of the liquid odorant from the vessel.

It should be appreciated that the gas burner apparatus of the present invention provides many advantages over gas burners of the prior art. The present gas burner apparatus provides for separation of liquid from the gas introduced into the separator vessel and provides a means for collecting the liquid which is separated from the gas. Furthermore, the apparatus of the present invention provides a means for return of liquid to the storage tanks without wasting the liquid or exposing it to the atmosphere. In addition, the apparatus provides a means for further separation of liquid from the gas between the vessel and gas burner head and a means for conveniently catching that liquid in the vessel positioned directly therebeneath. Also, the present invention provides a novel burner head and pilot burner arrangement for creating a turbulence or draft to draw air into a combustion chamber to provide complete combustion at any desired rate of burning of gas at the burner head.

It will be observed by those skilled in the art that the capabilities of the gas burner apparatus described herein fulfill the need for an efficient gas burner and one which is capable of clean and complete combustion of gas at any rate of burning. For example, with the gas burner apparatus of the present invention employing a burner head plate of 3½ inches in diameter with ¾-inch diameter ports, a standard 12-inch diameter pipe for the tubular combustion chamber, and pilot burner outlets of ⅛-inch diameter, in an arrangement as shown in the drawings, may be used to dispose of 4000 cubic feet of gas from an underground storage tank in approximately 12 minutes. With prior art gas burners for this application, 4 to 5 hours were required. Also, it should be appreciated that the gas burner apparatus in accordance with the present invention can be made in various sizes so that portable gas burner apparatuses may be provided in accordance with the present invention for disposing of gas at a variety of locations.

While the present invention has been described with particular reference to a specific embodiment thereof in the interest of complete definiteness, it will be understood that it may be embodied in a large variety of forms different from the one specifically shown and described without departing from the scope and spirit of the invention as defined by the appended claims.

I claim:

1. Gas burner apparatus comprising:

a vessel having an upper portion and a lower portion, first conduit means for introducing gas into the upper portion of the vessel,

a burner head having a plurality of ports for directing gas outwardly from the burner head,

a tubular burner chamber having a sidewall surrounding the burner head and supported to provide a space between the burner head and the chamber, the chamber extending above the burner head and being open at its ends to permit flow of air through the chamber, second conduit means including valve means for venting gas upwardly from the upper portion of the vessel to the burner head, and

third conduit means for permitting withdrawal of liquid from the lower portion of the vessel.

2. The gas burner apparatus of claim 1 in which the first conduit means directs the gas along a sidewall of the vessel in its upper portion.

3. The gas burner apparatus of claim 2 in which first conduit means directs the gas generally tangentially

around the sidewall of the vessel to provide a swirling motion of the gas in the vessel.

4. The gas burner apparatus of claim 1 in which the burner head is disposed above the vessel and the valve means of the second conduit means is positioned between the vessel and burner head.

5. The gas burner apparatus of claim 4 in which the gas is introduced into the vessel under pressure and the valve means of the second conduit means relieves pressure from the gas.

6. The gas burner apparatus of claim 1 in which the ports of the burner head direct gas upwardly and outwardly toward the sidewall of the chamber at an angle to the sidewall for causing a turbulence to draw air upwardly into the chamber.

7. The gas burner apparatus of claim 6 in which the ports are arranged in an annular array around the burner head to draw air upwardly around the burner head between the tubular chamber and burner head.

8. The gas burner apparatus of claim 1 in which the first and third conduit means each include valve means.

9. The gas burner apparatus of claim 1 further comprising a pilot burner disposed in the tubular chamber and having a pilot head with a plurality of gas outlets for directing gas toward the flow of gas from the ports of the burner head.

10. The gas burner apparatus of claim 9 in which the ports of the burner head are arranged in an annular array in the burner head and are adapted to direct gas upwardly and toward the sidewall of the chamber to cause a turbulence to draw air upwardly into the chamber and the pilot head is disposed around the burner head.

11. The gas burner apparatus of claim 9 in which the pilot head includes another plurality of gas outlets for directing gas upwardly in the tubular chamber and toward the sidewall for causing a turbulence to draw air upwardly into the chamber.

12. The gas burner apparatus of claim 11 in which the ports of the burner head are arranged in an annular array in the burner head and direct gas upwardly and toward the sidewall of the chamber to cause a turbulence to draw air upwardly into the chamber.

13. The gas burner apparatus of claim 12 in which the pilot head surrounds the burner head.

14. The gas burner apparatus of claim 1 further comprising a pilot burner disposed in the tubular chamber and having a pilot head with a plurality of gas outlets for directing gas upwardly and toward a sidewall of the chamber to cause a turbulence to draw air upwardly into the chamber.

15. The gas burner apparatus of claim 1 in which the ports of the burner head are adapted to direct gas upwardly and outwardly toward the side wall of the tubular chamber to create draft to draw air upwardly into the tubular chamber.

16. The gas burner apparatus of claim 1 in which the burner head is positioned directly above the vessel and the second conduit extends upwardly from the vessel to the burner head.

17. The gas burner apparatus of claim 16 in which the valve means in the second conduit includes a pressure relief valve.

18. The gas burner apparatus of claim 1 in which the first conduit means connects the upper portion of the vessel with a gas system and the third conduit means connects the lower portion of the vessel with the gas system for returning liquid to the gas system.

19. The gas burner apparatus of claim 18 in which the first and second conduit means each includes valve means.

20. The gas burner apparatus of claim 1 in which the burner head is disposed above the vessel and the valve means of the second conduit means is positioned directly above the vessel in the second conduit so that any liquid

separated from the gas at the valve means drains into the vessel for collection in the lower portion of the vessel.

21. The gas burner apparatus of claim 1 in which the first conduit connects the upper portion of the vessel with a gas and liquid odorant system and the third conduit means connects the lower portion of the vessel with the system for returning liquid odorant separated from the gas to the system.

22. The gas burner apparatus of claim 1 in which the first conduit means introduces a gas and liquid mixture into the upper portion of the vessel and directs the mixture around a sidewall of the vessel to provide a swirling motion of the mixture in the vessel to precipitate liquid from the gas, the liquid separated from the gas being collected in the lower portion of the vessel.

23. The gas burner apparatus of claim 22 in which the valve means of the second conduit is adapted to precipitate liquid from the gas and is positioned above the vessel so that liquid separated from the gas at the valve means drains into the vessel for collection in the lower portion of the vessel.

24. The gas burner apparatus of claim 1 in which the first conduit means connects the upper portion of the vessel with a gas and liquid system and the third conduit means connects the lower portion of the vessel with the system.

25. The gas burner apparatus of claim 1 in which the ports of the burner head and the sidewall of the tubular chamber are arranged such that gas passing from the burner head into the chamber causes a turbulence in the chamber to draw air into the chamber.

26. The gas burner apparatus of claim 1 further comprising a pilot burner disposed in the tubular chamber and having a pilot head with a plurality of gas outlets for directing gas into the tubular chamber to cause a turbulence in the chamber to draw air into the chamber.

27. The gas burner apparatus of claim 1 further comprising a pilot burner disposed in the tubular chamber and having an annular pilot head surrounding the burner head, the pilot head having a plurality of gas outlets for directing gas adjacent the flow of gas from the ports of the burner head.

28. The gas burner apparatus of claim 27 in which the ports of the burner head and the sidewall of the tubular chamber are arranged such that the gas passing from the burner head into the chamber causes a turbulence in the chamber to draw air into the chamber, and the pilot head having another plurality of gas outlets for directing gas into the tubular chamber to cause a turbulence in the chamber to draw air into a chamber.

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