United States Patent

[11] **3,619,094**

[72] Inventor **La Clede Lientz**
Hollister, Mo.

[21] Appl. No. **835,284**
[22] Filed **May 21, 1969**
[45] Patented **Nov. 9, 1971**

[73] Assignee **Chemetron Corporation**
Chicago, Ill.

[54] **BURNER AND METHOD FOR ODOR ELIMINATION**
4 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **431/5**
[51] **Int. Cl.** **F23j 15/00**
[50] **Field of Search** 431/5, 115, 158, 8, 9, 10, 202

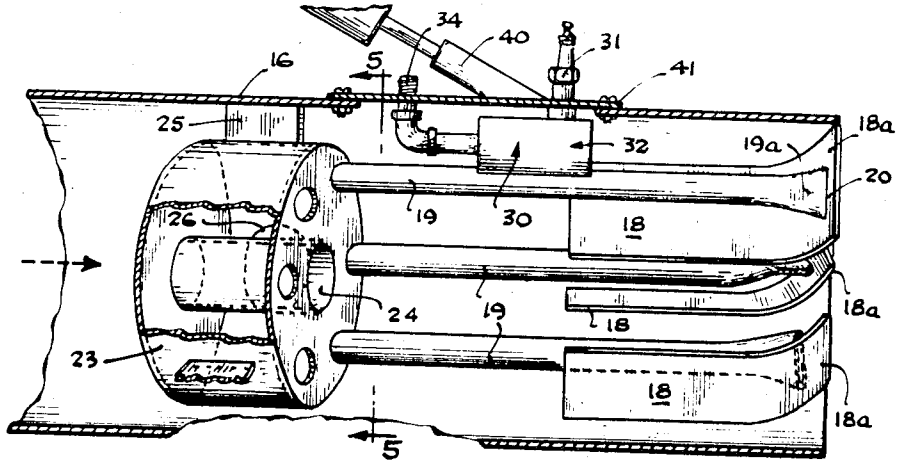
[56] **References Cited**

UNITED STATES PATENTS

2,769,504	11/1956	Miller	431/5 X
2,925,858	2/1960	Reed	431/115
3,078,914	2/1963	Bigelow, Jr.	431/115
3,285,316	11/1966	Gustafson et al.	431/238 X
3,369,587	2/1968	Taubmann	431/158 X

Primary Examiner—Frederick L. Matteson
Assistant Examiner—Robert A. Dua
Attorney—Nicholas M. Esser

ABSTRACT: A burner and method which can substantially eliminate odorous materials or smoke from an airstream at a high volume. Air containing odorous materials is directed at a high rate and volume around a multiplicity of tubular members having flared or elongated passageways. The odorous air is directed around the ends of the passages by vanes and the fuel in the tubular members is combined therewith between the ends of the passages and the vanes to incinerate the odorous substances in the air a short distance from the vanes.



PATENTED NOV 9 1971

3,619,094

SHEET 1 OF 4

Fig.1

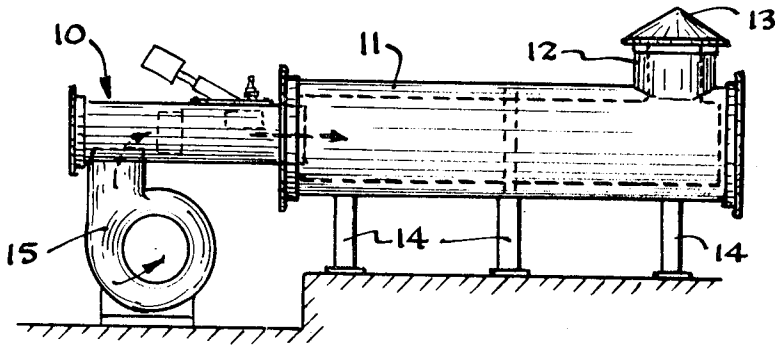
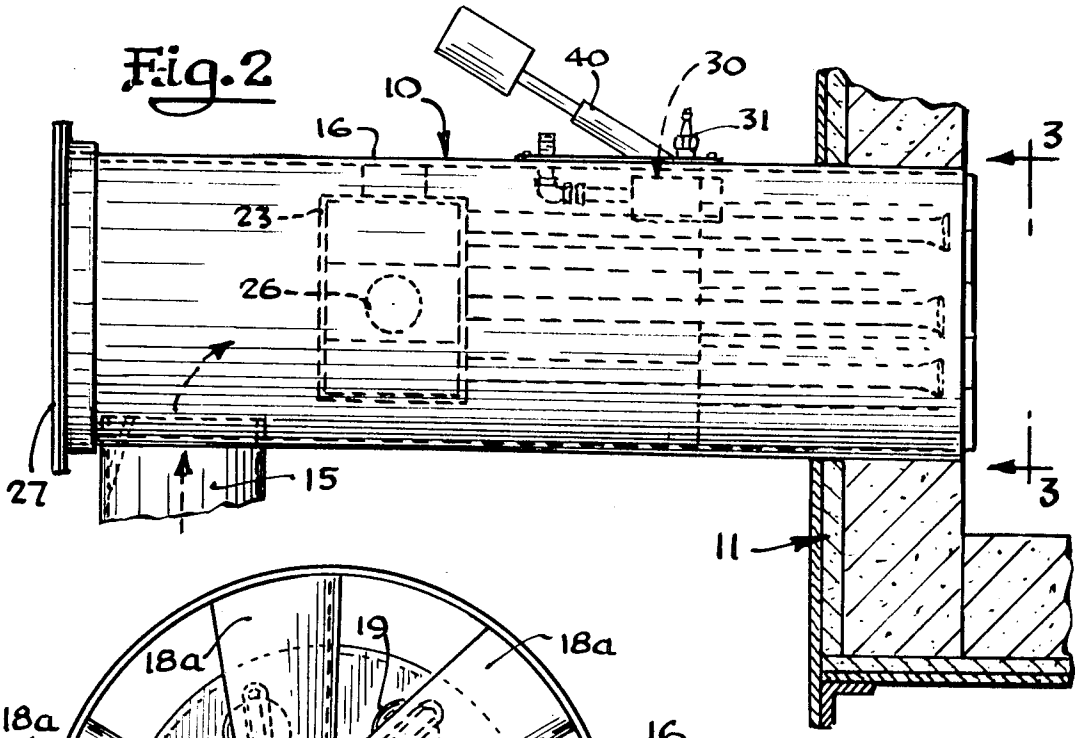


Fig.2



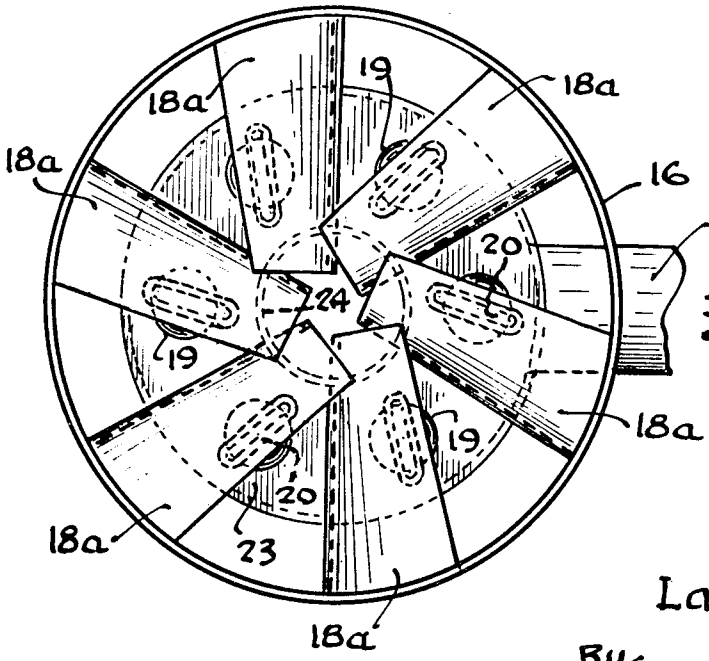


Fig.3

Inventor
La Clede Lientz
By
Attorney

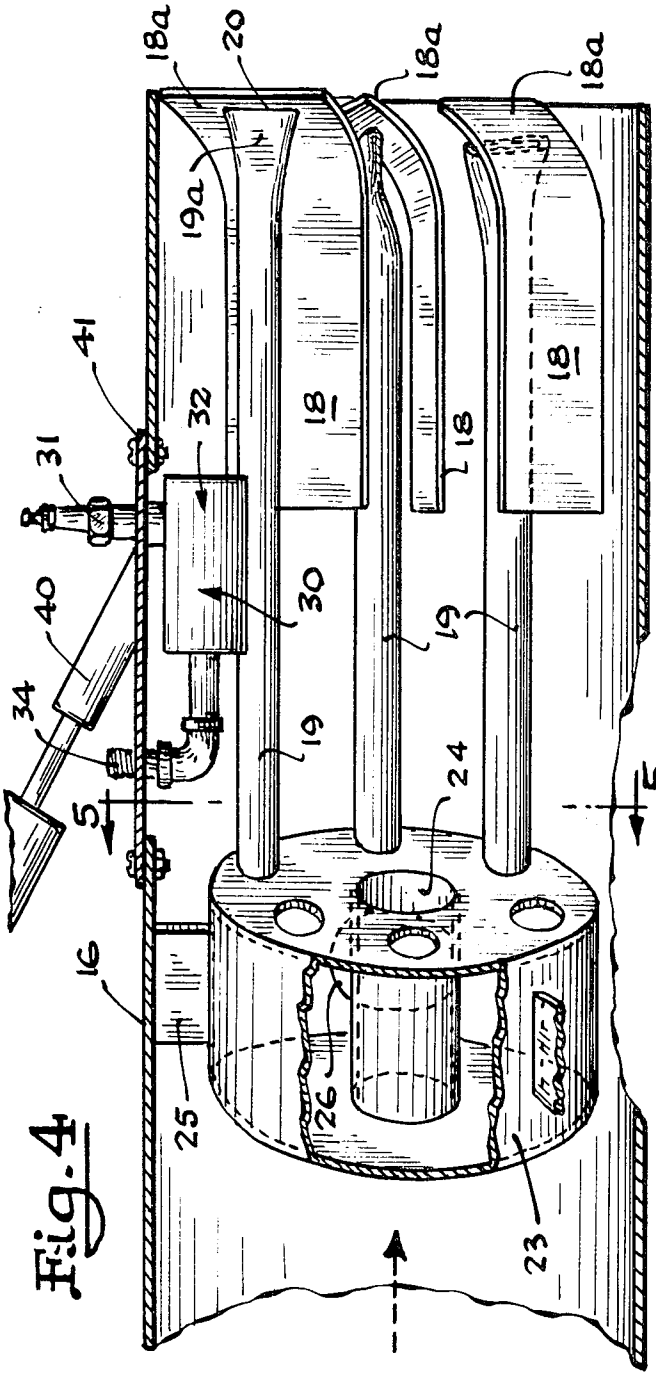


Fig. 4

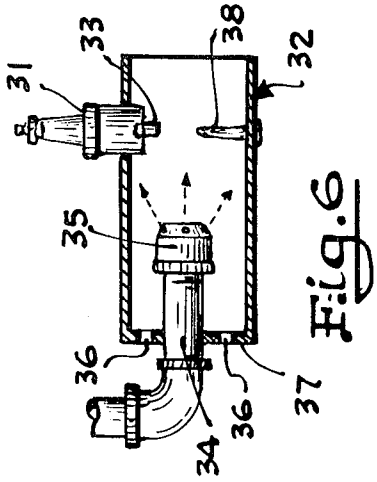


Fig. 6

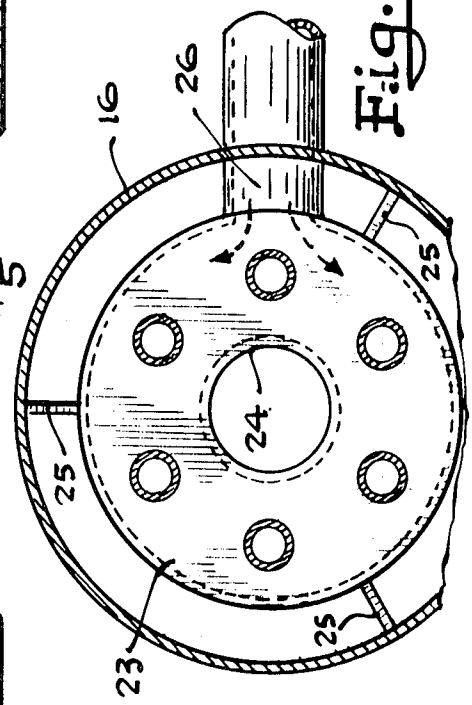
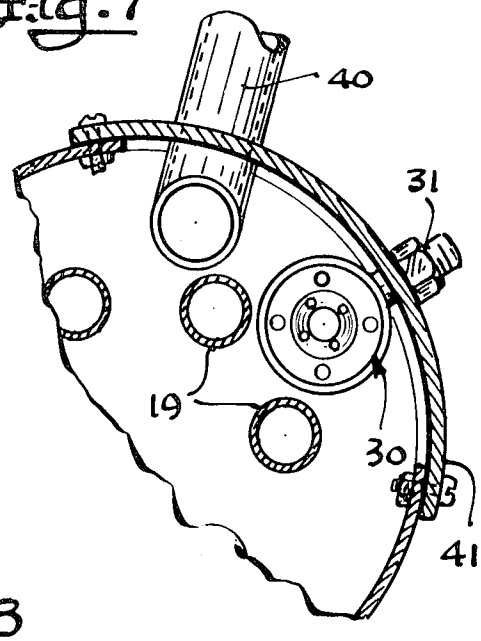


Fig. 5

Inventor
LaClede Lientz
By
Attorney

Fig.7



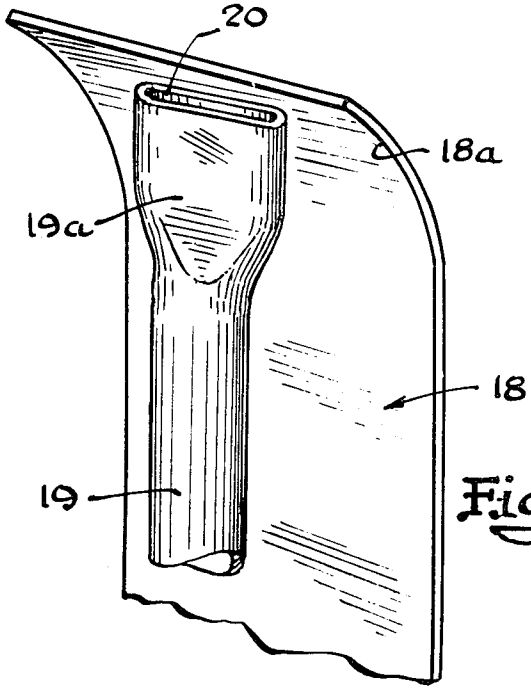


Fig.8

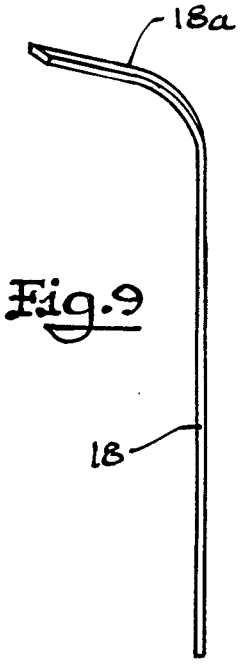
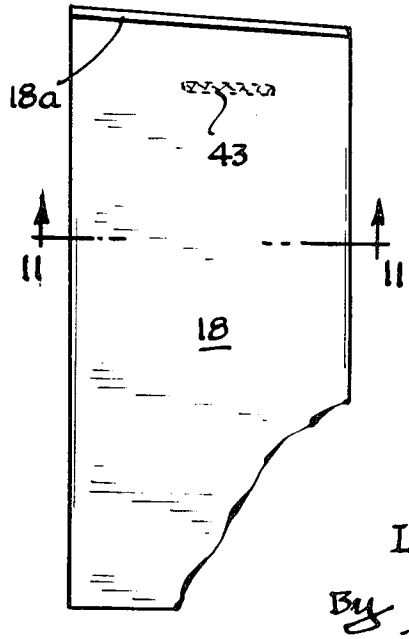


Fig.9

Fig.10



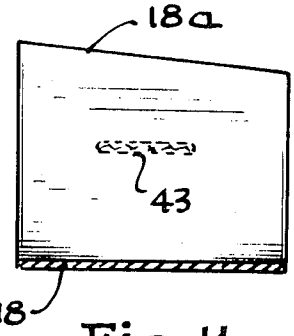
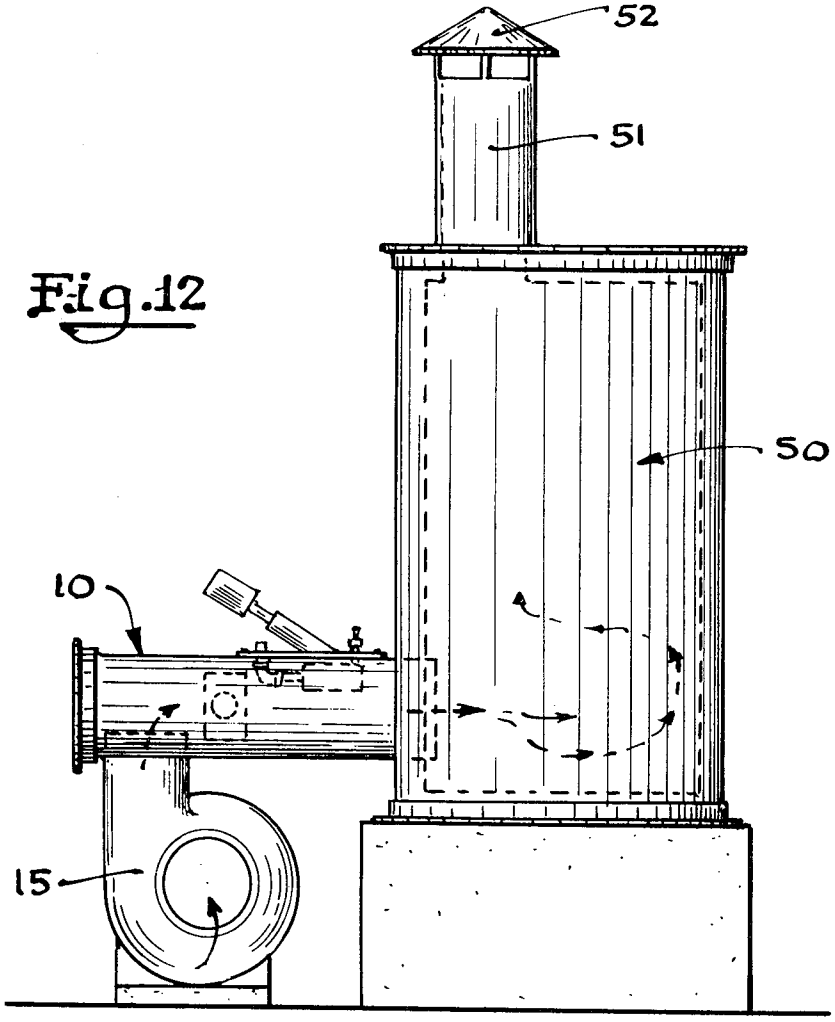


Fig.11

Inventor
LaClede Lientz
By
Attorney

Fig. 12



Inventor
La Clede Lientz
By
Attorney

BURNER AND METHOD FOR ODOR ELIMINATION

BACKGROUND OF THE INVENTION

This invention relates to a burner and method for substantially reducing odor or smoke forming materials in an airstream. More particularly, the invention is concerned with a burner which can combust the odor-forming materials in air by directing them at a high volume and velocity around the ends of a multiplicity of tubular members which supply combustible fuel through an elongated orifice.

Presently available burners are designed to produce a flame which in introduced into an odorous airstream or alternatively the odor-containing material is passed through the burner flame. Whereas some available burners will incinerate odors successfully, they do not have the capacity to do so at high capacities and temperatures. Available burners leave much to be desired in the area of efficient combustion in that much of the fuel is not combusted due to poor flame stability or much of the odor-forming materials in the air or gas stream do not come in contact with the flame portion of the burner. Further, problems arise with burners of the type concerned with in this invention because of plugging of the fuel nozzle due to the nature of the materials which must be incinerated.

It is an object of the present invention to provide a novel burner and method which can combust odor-forming materials in a gaseous stream with maximum efficiency. It is another object of this invention to provide a burner and method of combustion which has a high capacity and flow rate for burning odorous materials in an airstream. It is still another object of the present invention to provide a burner for reducing odors in an airstream which can be manufactured economically and without extensive tooling. It is yet another object of this invention to provide a burner member which can operate in large volume flow rates while maintaining flame stability.

SUMMARY OF THE INVENTION

The foregoing objects are accomplished and the shortcomings of the prior art are overcome by the present method wherein a stream of odorous, gaseous material is directed along a flow path while a multiplicity of fuel streams are provided in a combustion zone. The fuel streams are elongated in horizontal section and portions of the odorous stream are directed in a transverse manner through the fuel in the zone so that the major portion of the stream is in direct contact with the fuel to form individual flames, the oxygen in the effluent stream actually supporting combustion of the fuel. The burner for effecting the method is comprised of a multiplicity of tubular members enclosed in a housing with directional vanes spaced from the ends of the tubular members. The ends of the tubular members adjacent the vanes are elongated to provide an extended fuel stream across and between the ends of the tubular members and the vane. For improved flame stability, an indentation is provided in the vane portion directly opposite the elongated orifice with the indentation in alignment with the orifice of the tubular member. The portion of the vanes adjacent the ends of the tubular members are tapered outwardly and away from the ends of the elongated orifices.

BRIEF DESCRIPTION OF DRAWINGS

A better understanding of the present burner and method will be accomplished by reference to the drawings wherein:

FIG. 1 is a view in side elevation showing the burner mounted in a furnace.

FIG. 2 is an enlarged view in side elevation of the burner shown in FIG. 1.

FIG. 3 is an end view of the burner taken long line 3—3 of FIG. 2.

FIG. 4 is a view of vertical section of the burner shown in FIG. 2.

FIG. 5 is a view in horizontal section of the burner taken along line 5—5 of FIG. 4.

FIG. 6 is a view in vertical section of the pilot ignition assembly for the burner shown in the previous Figures.

FIG. 7 is a partial view in horizontal section of the burner shown in FIG. 4 illustrating the placement of the pilot ignition assembly with respect to the flame detector.

FIG. 8 is a partial view of a vane member shown in burner of FIG. 4 illustrating the location of a fuel gas tube with respect to the vane.

FIG. 9 is an end view of the vane member shown in FIGS. 8 and 4.

FIG. 10 is a view in side elevation of the vane shown in FIG. 9.

FIG. 11 is a view in horizontal section taken along line 11—11 of FIG. 10.

FIG. 12 is a view in side elevation showing the previously illustrated burner in a vertical type furnace.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The device for best carrying out the method of this invention is burner generally 10 which is connected to a furnace 11, which can be composed of a brick or other suitable material, having an upstanding outlet 12 protected by a rain cover 13 and supported by footers 14. A centrifugal type blower 15 supplies odorous air to burner 10 adjacent the end opposite furnace 11. Referring specifically to FIGS. 2–5, burner 10 is composed of an annular housing 16 which has secured laterally to the inner surface thereof, preferably by welding, curved directional vane members 18 which are substantially L-shaped terminating near the end of burner housing 16 which is in contact with furnace 11. Extending laterally to and spaced from the vanes 18 adjacent the leg portion 18*a* of the L-shaped vanes are a multiplicity of tubular members 19 each having an elongated orifice 20 formed by flattened portion 19*a* and enclosed in housing 16. The orifice 20 of tubular member 18 is disposed transversely with respect to the longitudinal axis of the leg of the L-shaped vane and the leg portion of the vane is curved around orifice 20 and in a manner so that the portion of the vane adjacent the orifice tapers outwardly and away from orifice 20 with the leg of vane 18 extending a sufficient distance to completely cover orifice 20 of the tubular members 19. Vanes 18 have a lesser degree of curvature at the side adjacent the inside of housing 16 than at the opposite side for the purpose of compensating for the greater radius of curvature at the housing wall as compared to the inner portion. This provides more even distribution of the odorous gas and fuel stream over the circular area of the burner end. At the end of tubular members 19 opposite the orifices 20 is an annular manifold 23 which has a hollow circular center section 24 and is supported concentrically inside housing 16 by means of flanges 25 and a fuel gas inlet pipe 26. A circular cap 27 encloses burner 10 opposite furnace 11.

Disposed laterally and carried by housing 16 is an ignition and pilot light means 30 which includes a spark plug 31 the sparking end of which is enclosed by a cylindrical housing 32. As best shown in FIG. 6, a gas inlet pipe 34 connected to low pressure gas source communicates internally in cylindrical housing 32 and with a multiapertured nozzle 35. Air enters the cylindrical housing 32 by apertures 36 in the end wall 37. Secured adjacent to the cylindrical housing 32 is a flame detector 40 of the ultraviolet light type. For ease of repair, it will be noted that the pilot and ignition assembly 30 and the flame detector 40 are secured to a plate 41 which is bolted to the side of housing 16.

Referring specifically to FIGS. 10 and 11 it will be seen that an indented portion 43 is provided in the underside and in leg portion 18*a* of vane 18. This indentation is positioned to be axially aligned with the elongated orifice 20 of each tubular member 19 and is an important factor for flame stabilization when large volumes of air containing odorous materials are passed around the inner side of leg portions 18*a*.

OPERATION

A better understanding of the advantages of burner 10 will be had by a description of its operation. Natural gas from a suitable source and pressure is introduced into pipe 34 of the

pilot ignition means **30**. With the gas issuing from nozzle **35** a charge of electric current from a suitable coil (not shown) is supplied to spark plug **31** and arcs from the electrode **33** to ground point **38** to ignite the flame from nozzle **35**. The presence of the flame is indicated by flame detector **40**. When it is desired to incinerate odors from a gaseous stream such as an airstream, natural gas is introduced into pipe **26**. After sufficient gas has accumulated inside the burner housing **16** it will be ignited by the flame in pilot **30**. Natural gas is introduced into gas pipe **26** and adjusted at a flow rate in the range of 40 to 125 cubic feet per minute to produce 250 to 2,500 B.t.u. per hour. Immediately thereafter the odorous air gases as from a slaughtering house are blown into burner **10** and into the inside of housing **16** by blower **15** at a rate in the range of 800 to 2,500 cubic feet per minute. A multiplicity of flames being elongated in horizontal cross section will be formed and extend from orifices **20**. The odorous gas is directed along tubular members **19** and in a direction substantially parallel to the direction of the flames. The odorous gas will contact the underside of leg portions **18***a* of vanes **18** and be directed substantially in a transverse manner through the fuel stream in the combustion zone. By having a multiplicity of fuel streams and a vane for each flame the major portion of the odorous gas stream is brought into contact with the fuel by having individual portions of the odorous stream contact the fuel. As the odorous gas stream is incinerated it will exit from the burner **10** in a stream having a vortex flowing in a clockwise manner when viewed from the direction the odorous stream enters the burner. This is effected by the vanes **18** being disposed in a circular manner around the inside housing **16** burner with the leg portions turned in a clockwise manner. The purpose of furnace **11** is to give added retention time for combustion of the odorous materials before being discharged to atmosphere.

An improved result is effected by the odorous gas being divided into several streams by vanes **18** and directed and intermixed with the fuel at high velocities. This affords efficient combustion of the odorous material and eliminates the "enveloping effect" which is caused by warm air insulating the odorous material from the flame. As viewed from the back of the burner, the composite flame will be in the form of a rolling ball of fire. However, the vanes **18** will not become excessively heated because combustion takes place approximately one-half inch from beyond the vane and outside housing **16** with the surrounding air acting as an insulator for the vane.

DESCRIPTION OF ALTERNATIVE EMBODIMENT

Referring specifically to FIG. **12** it will be seen that burner **10** is disposed laterally in a vertical type furnace **50** having an outlet **51** with rain cap **52** positioned transversely with respect to the flow of fuel and odorous gas through burner **10**. Burner **10** will function as previously described in furnace **10** except by being positioned transversely to the longitudinal axis of furnace **50** and outlet **51** a longer retention time for combustion is effected and the combusting materials will take a circuitous upward path before exiting through outlet **51**.

It will be noted that orifices **20** are elongated and the purpose is twofold. First, clogging of the orifice is prevented from grease and other heavy carbonaceous type materials. Second, an elongated flame for efficient combustion is afforded.

In the operation of burner **10**, odorous gases were blown into and through burner **10** at the ratio in the range of 800 to 2,500 cubic feet per minute. It will be understood that larger designs of burner **10** are envisioned with flow rates as high as 40,000 cubic feet per minute and smoke as well as odorous materials can be incinerated. For maximum combustion, a ratio of odorous gas to natural gas is preferably 20 to 1. However, the burner can operate at a ratio of 400–500 to 1 with some efficiency. Under the foregoing conditions flame stabilization in burner **10** is afforded by having the orifice **20** disposed from the inside adjacent leg portion **18***a* of vane **18** at a distance of about one-half inch. It will be noted that indentation **43** is oppositely disposed on the vane and extends approximately the same distance in length. An important result is effected with its use although the reason for it is not exactly known.

The preferred materials for fabricating vanes **18**, tubular members **19** and the housing **16** is stainless steel. However, other materials commonly used in the manufacture of burners of this type can be employed such as cast iron, steel, metal alloys or ceramics. Further, while a certain number of tubular members **19** and vanes **18** are illustrated, any number of same could be employed in a circular manner to afford combustion of odorous materials with provision that a sufficient number are provided with respect to the internal diameter of the burner.

Ignition and pilot means **30** includes a cylindrical housing **32** for the purpose of isolating the pilot flame from the main stream of odorous gas. This is to prevent contact by moisture and the high velocity of the stream which may extinguish the flame. It is understood that burner **10** could be operated without the ignition or pilot means **30** and any means for igniting the burner could be employed in its place.

It will thus be seen that through the present invention there is provided a method and apparatus for combustion of odorous gas streams which affords efficient combustion. The method involves a minimum amount of steps and the burner for effecting the method contains a minimum amount of parts. The burner is adaptable to a wide variety of odorous type materials and is easily installed in existing odorous exhaust streams. The burner contains no moving parts and thus its operation is easily maintained.

It will be apparent that certain modifications and changes will be necessary for adaptation to specific materials from time to time as will be suggested to those skilled in the art. It is intended that all such modifications and changes as come within the spirit of this invention are intended as being within its scope as best defined by the appended claims wherein there is claimed.

1. A method of combusting odorous or smoke forming combustible substances present in a fluid also containing an oxident comprising the steps of directing the fluid from one direction toward a combustion zone, directing a multiplicity of streams containing fuel from the same direction into said combustion zone, and deflecting the fluid into the combustion zone and substantially transversely into contact with the streams to form a multiplicity of flames.

2. The method of claim **1** further comprising the steps of dividing the fluid into individual fluid portions and deflecting each of said divided fluid portions into the combustion zone and substantially tranversely into contact with one of the streams containing fuel.

3. The method of claim **2** further comprising the step of deflecting each of said divided fluid portions to form a vortex in said combustion zone.

4. The method of claim **3** wherein said vortex is clockwise when viewed from the direction of the fluid being directed toward said combustion zone.

* * * * *