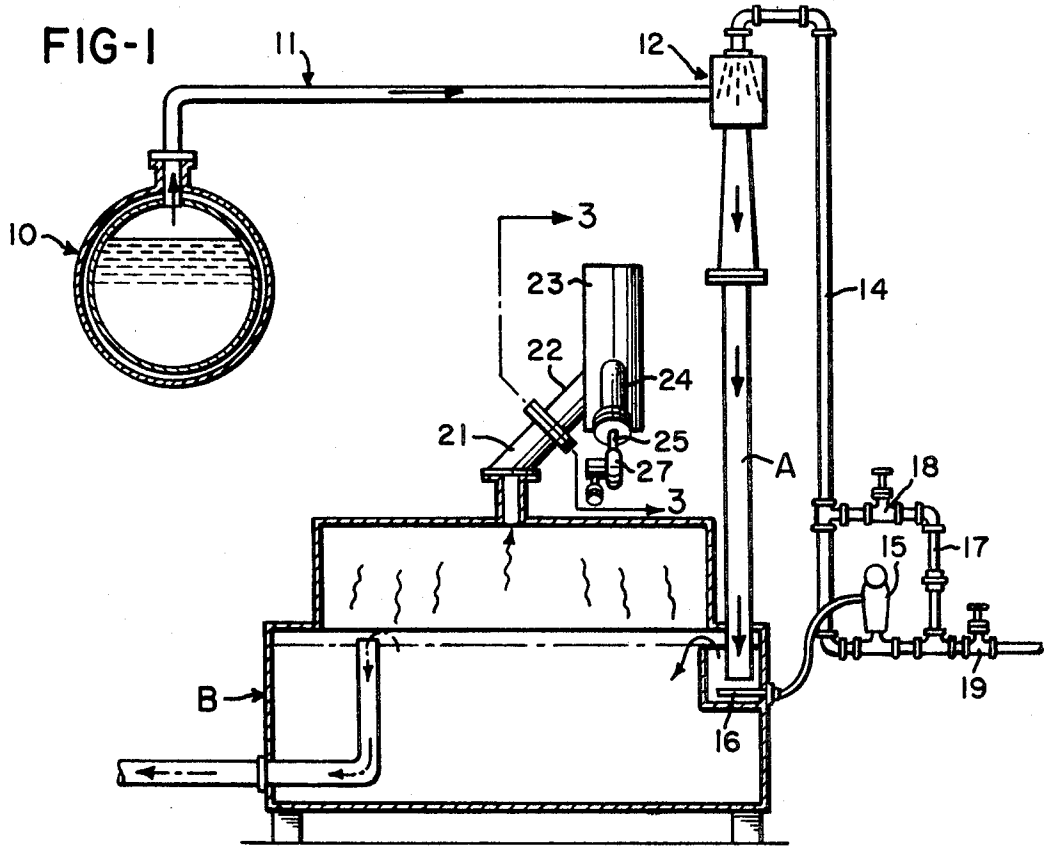
July 13, 1971 C. O. SCHMIDT 3,592,614

AFTERBURNER FOR COOKING DEVICE

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FIG-1



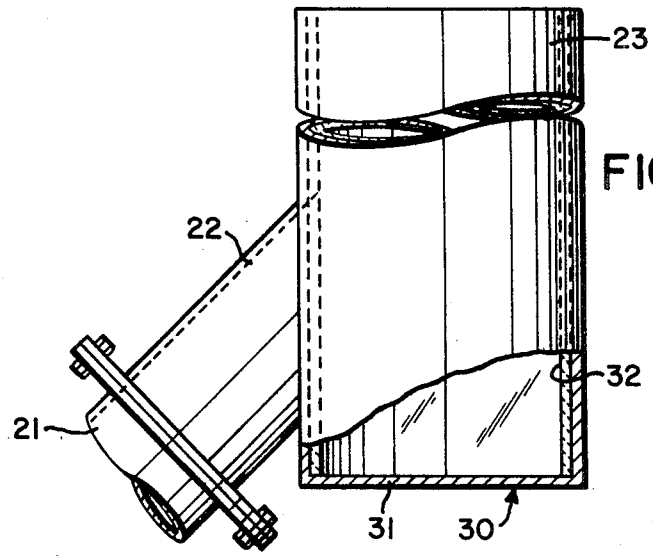


FIG-2

INVENTOR

CARL OSCAR SCHMIDT

BY J. Warren Kinney, Jr.

ATTORNEY

July 13, 1971 C. O. SCHMIDT 3,592,614

AFTERBURNER FOR COOKING DEVICE

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FIG-3

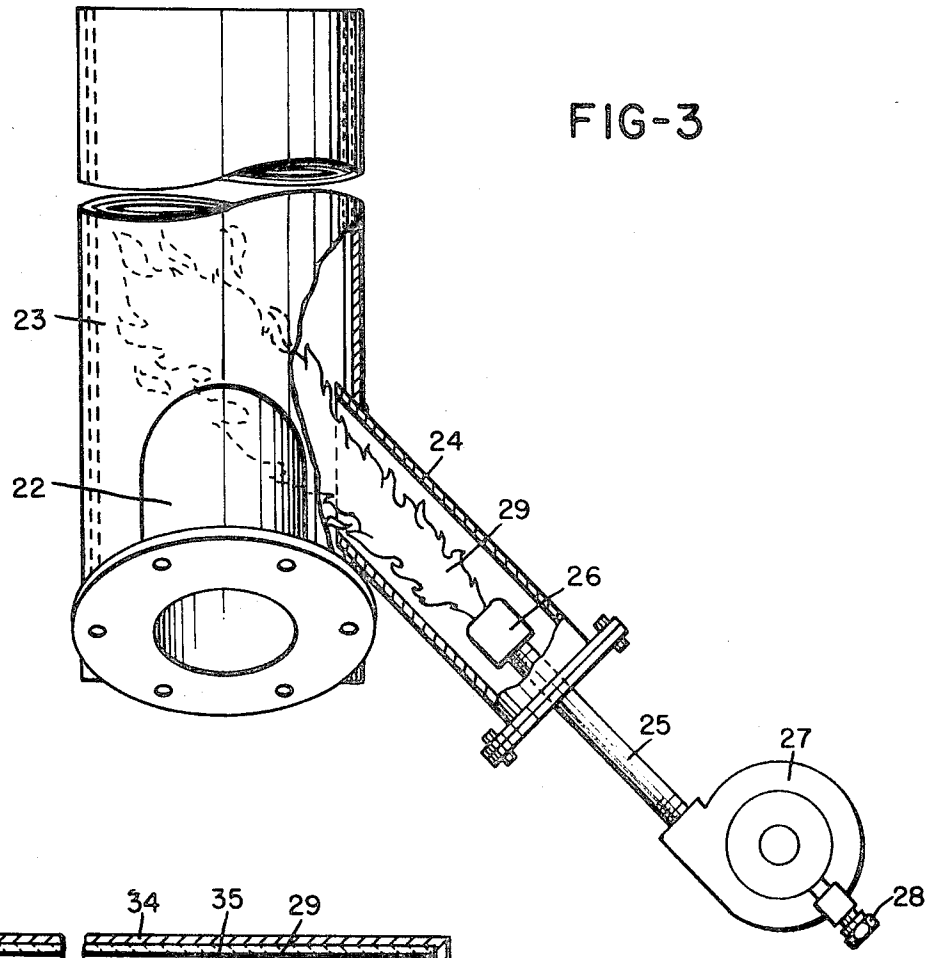
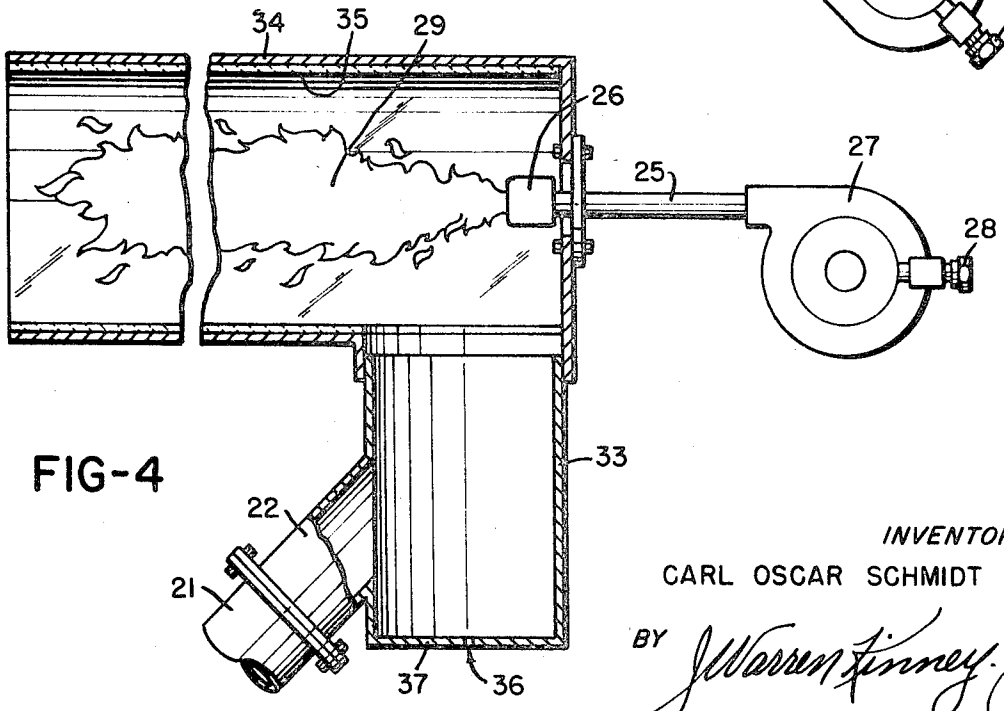


FIG-4



INVENTOR

CARL OSCAR SCHMIDT

BY J. Warren Kinney, Jr.

ATTORNEY

United States Patent Office 3,592,614 Patented July 13, 1971

3,592,614

AFTERBURNER FOR COOKING DEVICE

Carl Oscar Schmidt, Cincinnati, Ohio, assignor to The Cincinnati Butchers Supply Company, Cincinnati, Ohio

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U.S. Cl. 23—290.5 10 Claims

ABSTRACT OF THE DISCLOSURE

The non-condensable gases from a cooking device are incinerated by the intensely hot high velocity flame of an afterburner which is self contained and may be associated with any exhaust pipe in which non-condensable gases are present. The flame of the device is produced in an area in which water from the incinerated gases cannot extinguish the flame.

In cooking waste material such as animal offal, bones, and the like to remove the moisture therefrom so that the offal, bones and the like may later be treated to produce protein for chicken feed, for example, the vapors generated from cooking the material in the cooker are noxious and have an offensive odor. Therefore, it is necessary that the non-condensable, odorous gases of these vapors be completely incinerated before release to the atmosphere so as to eliminate their noxious property.

Since the vapors produced by cooking offal, bones and the like can be condensed, these vapors can be readily condensed after escaping from the cooker. However, the odorous, noxious gases are not condensable.

To prevent the non-condensable gases from being released to the atmosphere, it is necessary to incinerate these gases. This results in conversion of the oxidizable hydrocarbon constituents of the non-condensable gases to carbon dioxide and water vapor whereby the noxious property of the gases is no longer present.

Because of the incineration of the non-condensable gases, water vapor is produced during the conversion of the oxidizable hydrocarbon constituents of the non-condensable gases to carbon dioxide and water vapor. While the flame must be so located that it can produce a sufficiently high temperature to cause complete incineration of the non-condensable gases, the water from the water vapor can extinguish the flame unless the flame is positioned in an area in which the water produced by incineration of the non-condensable gases cannot reach the flame.

The present invention satisfactorily solves the foregoing problem by utilizing an afterburner having a high velocity flame that will incinerate the non-condensable gases. To insure that the flame of the afterburner is not extinguished by the water produced by the incineration of the non-condensable gases, the present invention utilizes a unique mounting arrangement for the flame producing means.

In one embodiment of the present invention, the flame producing means is disposed in a duct which is at an acute angle to a vertical stack into which the non-condensable gases are drawn. In this arrangement, the high velocity flame can incinerate the non-condensable gases within the vertical stack, to which they are drawn by the suction created by the flame, without the possibility of the flame being extinguished. This is because any water produced in the vertical stack due to incineration of the non-condensable gases cannot enter into the area in which the flame is produced.

In another embodiment of the present invention, the flame producing means acting as a jet is disposed above the vertical stack so that the water created by incineration of the non-condensable gases flows to the bottom of the vertical stack. Therefore, the water from the non-condensable gases cannot extinguish the flame of the burner so that complete incineration of the non-condensable gases is accomplished.

An object of this invention is to provide an afterburner for a cooking device.

Another object of this invention is to provide an afterburner for completely incinerating non-condensable gases of a cooking device.

A further object of this invention is to provide a uniquely arranged afterburner for a cooking device in which the afterburner is disposed so that its flame producing means is not extinguished by water from the non-condensable gases that are completely incinerated by the afterburner.

Still another object of this invention is to provide an afterburner in which the flame producing means also creates sufficient suction to cause the non-condensable gases which are to be incinerated, to enter the area in which the flame of the afterburner is effective.

Other objects of this invention will be readily perceived from the following description, claims and drawings.

The attached drawings illustrate preferred embodiments of the invention, in which:

FIG. 1 is an elevational view of a cooking device with which one form of the afterburner of the present invention is employed.

FIG. 2 is a fragmentary elevational view, partly in section, of a portion of the structure of FIG. 1.

FIG. 3 is an elevational view, partly in section of a portion of the apparatus of FIG. 1 including the afterburner and taken substantially along line 3—3 of FIG. 1; and

FIG. 4 is a sectional view of a portion of the structure of FIG. 1 and showing utilization of another embodiment of the afterburner of the present invention.

Referring to the drawings and particularly FIG. 1, there is shown a cooking device **10** for cooking material such as animal offal, bones or the like. One suitable example of the cooking device **10** is a cooker in which offal, bones, and the like are cooked to remove most of the water from the waste material. The cooker, which is shown in FIG. 1, is steam heated, but any other type of suitable heating means may be employed.

In cooking the waste material, the vapors escape from the cooking device **10** through a vapor line **11** to a vapor condenser **12**. Water is supplied to the vapor condenser **12** through a pipe **14**, which is connected to a suitable source of water under pressure, to cause condensation of the condensable vapors, the condensate flowing from the vapor condenser **12** through tail pipe A into the hot well B.

The pipe **14** has flow of water therethrough controlled by a control means **15**. The control means **15** is connected to a heat sensing means **16** such as a thermostat, for example, within the hot well B. Accordingly, the control means **15** allows water to flow to the vapor condenser **12** only when the condensate in the hot well B is at a sufficiently high temperature to require additional condensation of the vapors coming from the cooking device **10**.

All of the condensable vapors are condensed within the vapor condenser **12**. All of the water, which is produced from condensing the condensable vapors, escapes from the vapor condenser **12** through a tail pipe A into the hot well B. However, the vapor condenser **12** does not remove the non-condensable, noxious gases which are produced by the cooking device **10**, since some of the gases from the cooking device **10** are not condensable. If these non-condensable gases were allowed to pass to the atmosphere, their noxious property and offensive odors would create pollution of the air and possibly cause the cooking device **10** to have to be shut down.

Accordingly, all of the non-condensable gases pass from the hot well B through a pipe **21**. The pipe **21** is connected to and communicates with a pipe **22**, which is formed integral with a vertical stack **23**.

The vertical stack **23** has a duct **24** extending therefrom at an angle of 45° (see FIG. 3) to the longitudinal axis of the stack **23**. The duct **24** is closed at its lower end except for a pipe **25** extending therethrough.

The pipe **25** has a fuel, which is preferably gas, and air flow therethrough for introduction into the duct **24**. The end of the pipe **25** has a nozzle **26** thereon and within which the ignition of the gas occurs. The initial combustion of the gas within the nozzle **26** is accomplished by utilizing a match, which is inserted through a small opening (not shown) in the duct **24**.

The pipe **25** is connected to a high velocity blower **27**. The high velocity blower **27** sucks in air from the atmosphere for mixing with gas, which is introduced into the blower **27** through a pipe **28**. The pipe **28** is connected to a suitable source of gas under pressure. A valve in the pipe **28** controls the flow of gas therethrough.

The ignited gas from the nozzle **26** creates a very hot jet flame **29** (see FIG. 3). The flame **29** has a very high velocity due to the blower **27** so that the flame **29** extends into the vertical stack **23**. The velocity of the flame **29** is sufficient to create a sufficient suction in the vertical stack **23** to cause the non-condensable gases to flow or be drawn from the hot well B through the pipes **21** and **22** to the vertical stack **23**. Furthermore, the flame **29** has a sufficiently high temperature to cause complete incineration of the non-condensable gases within the vertical stack **23**. As a result, the oxidable hydrocarbon constituents of the non-condensable vapors are converted to carbon dioxide and water vapor.

The carbon dioxide escapes through the upper end of the vertical stack **23** to the atmosphere. The water vapor is partly condensed into water and flows downwardly to the bottom of the vertical stack **23**. The water escapes from the vertical stack **23** through an opening **30** (see FIG. 2) in its lower wall **31**, which closes the bottom of the vertical stack **23**.

Since the duct **24** extends into the stack **23** a sufficient distance as shown in FIG. 3, the water on the inner surface of the vertical stack **23** is deflected around the duct and cannot flow into the duct **24** but must flow to the bottom of the vertical stack **23**. Accordingly, the water within the vertical stack **23** cannot flow into the nozzle **26** to cause the flame **29** to be extinguished.

The inner surface of the vertical stack **23** is lined with a refractory material **32**. This is to protect the vertical stack **23** from the intense heat created by the flame **29**.

Considering the operation of the afterburner of the embodiment of FIGS. 1 to 3, the cooking device **10** is loaded with waste material. As previously mentioned, the waste material could be offal, bones, and the like that are to be cooked within the cooking device **10**. If the offal, bones, and the like weighed 10,000 pounds, 5,000 pounds of this total would be water that must be evaporated. Accordingly, this would require approximately 2,000 pounds of water to be condensed each hour by the vapor condenser **12**.

The gases which have not been condensed in the vapor condenser **12**, pass from the vapor condenser **12** through the tail pipe A into the hot well B.

When the non-condensable gases escape from the hot well B through pipe **21** and **22** into the vertical stack **23**, the intensity of the jet flame **29** is sufficient to cause all oxidizable hydrocarbon constituents of the non-condensable gases to be converted into carbon dioxide and water vapor. The carbon dioxide escapes through the upper end of the vertical stack **23** while the water vapor is partly condensed and flows through the opening **30** in the lower wall **31** of the vertical stack **23**.

Referring to FIG. 4, there is shown another arrangement of the afterburner of the present invention in which

the vertical stack **23** is replaced by a similar vertical stack **33**. However, the vertical stack **33** is not lined with the refractory material **32**. Furthermore, the flame **29** is not introduced into the vertical stack **33**.

The upper end of the vertical stack **33** has a horizontal duct **34** communicating therewith. The flame **29** is produced within the duct **34** from the nozzle **26**. Thus, the inner surface of the duct **34** is lined with a refractory material **35**.

The flame **29** is introduced with sufficient velocity into the duct **34** by the blower **27** to create a sufficient suction in the vertical stack **33** to cause the non-condensed gases from the hot well B to flow through the vertical stack **33** and into the duct **34**. Because of the temperature of the flame **29** within the duct **34**, the non-condensed gases have their oxidizable hydrocarbons converted into carbon dioxide and water vapor. When the water vapor condenses, it again flows to the lower end of the vertical stack **33** and escapes therefrom through an opening **36** in lower wall **37** of the vertical stack **33**.

Thus, the operation of the embodiment of FIG. 4 is the same as that for FIGS. 1 to 3. The only difference is that the jet flame **29** is not introduced into the vertical stack but is introduced above the vertical stack. However, there is no possibility of the flame **29** being extinguished by water produced by the incineration of the non-condensed vapors.

While the afterburner of the present invention has been described for utilization with a hot well B such as used with a cooker for cooking offal, bones, and the like, it should be understood that the afterburner of the present invention may be readily employed with any type of combustion or cooking device producing noxious gases. For example, the afterburner of the present invention could be employed with a trash burning device.

An advantage of this invention is that it insures that the noxious gases of waste material or the like from a combustion or cooking device are not vented to the atmosphere. Another advantage of this invention is that is prevents the flame of an afterburner from being extinguished by water produced during complete incineration of noncondensable gases.

What is claimed is:

1. An afterburner device for incinerating noncondensable gases, wherein means is provided for reducing a material to components that include condensable vapors and noncondensable gases and including condensing means for condensing the condensable vapors, means for conveying the noncondensable gases to the afterburner, said afterburner comprising a stack having an open top end and a closed bottom end, an inlet into said stack adjacent the closed end thereof for conveying said noncondensable gases into said stack, flame producing means disposed in communication with said stack above said inlet for burning said noncondensable gases, said flame producing means including blower means and nozzle means disposed externally of said stack but in communication therewith through a duct extending through the wall of said stack and having an end portion thereof extended past the wall of said stack to define a deflector for moisture running down the wall of said stack so that moisture produced as a result of burning said gases will not flow into said duct and extinguish said flame producing means, and vent means in said closed end of said stack for venting said moisture from said stack.

2. An afterburner device for incinerating noncondensable gases, wherein means is provided for reducing a material to components that include condensable vapors and noncondensable gases and including condensing means for condensing the condensable vapors, means for conveying the noncondensable gases to the afterburner, said afterburner comprising a stack having an open top end and a closed bottom end, an inlet into said stack adjacent the closed end thereof for conveying said noncondensable

gases into said stack, flame producing means disposed in communication with said stack above said inlet for burning said noncondensable gases, said flame producing means including blower means and nozzle means disposed externally of said stack but in communication therewith through a duct extending generally laterally across the open top end of said stack so that moisture produced as a result of burning said gases will fall to the closed bottom end of said stack and will not extinguish said flame producing means, and vent means in said closed end of said stack for venting said moisture from said stack.

3. A combustion device including:

means to cook a material that produces vapors including condensable vapors and noncondensable gases;

means to condense the condensable vapors, said condensing means comprising a water spray directed through the vapors;

means to receive the noncondensed gases, said receiving means comprising a stack open at one end and closed at the other end and having an inlet intermediate said ends for said noncondensed gases;

flame producing means in communication with said stack for producing a flame of sufficient temperature to incinerate the noncondensed gases, said flame producing means disposed in a duct means positioned above said inlet and relative to said stack so that moisture produced as a result of incineration of the noncondensed gases cannot flow to said flame producing means.

4. The combustion device according to claim 3 wherein the inlet is adjacent the lower end of said stack, and said duct and said flame producing means are disposed in communication with said stack intermediate the ends thereof, said duct including an end portion thereof extended through the wall of said stack and projecting inside said stack to define a deflector for moisture running down the wall of said stack.

5. The combustion device according to claim 3 wherein said flame producing means includes means for creating a suction in said stack to cause the noncondensed gases to enter said stack.

6. The combustion device according to claim 4 in which said duct is disposed at an acute angle to said vertical stack.

7. The combustion device according to claim 4 in which said duct is disposed at angle of 45° to said vertical stack.

8. The combustion device according to claim 4 in which:

said duct is disposed substantially perpendicular to said vertical stack;

and said duct communicates with the upper end of said vertical stack.

9. The combination device according to claim 3 in which said flame producing means produces a jet flame.

10. The combustion device according to claim 3 in which said flame producing means includes means to introduce the flame into said duct at a high velocity.

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JAMES H. TAYMAN JR., Primary Examiner

U.S. Cl. X.R.

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