

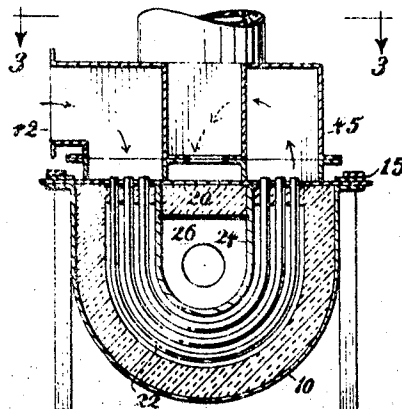
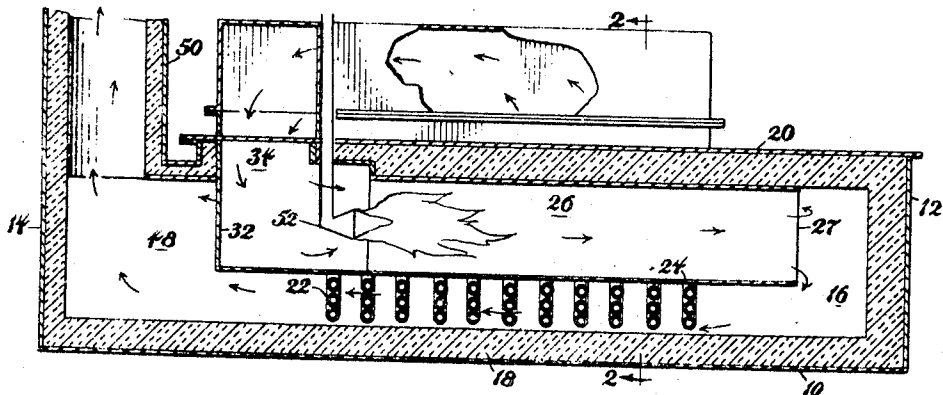
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[56] **References Cited**
UNITED STATES PATENTS
 3,090,675 5/1963 Ruff et al. 23/277
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[54] **FUME INCINERATOR**
2 Claims, 4 Drawing Figs.

[52] U.S. Cl. 23/277 C,
 165/81, 122/7 B, 122/235 G, 285/363, 285/368,
 285/187, 277/26
 [51] Int. Cl. F23g 7/06
 [50] Field of Search 23/277 C,
 284, 288.3 F; 165/81-83; 122/235 G, 7 B;
 285/363, 368, 187; 277/26

ABSTRACT: A fume incinerator in which gases containing harmful or obnoxious fumes are preheated before being directed into a combustion chamber. The preheated gases containing air for combustion are then thoroughly mixed with fuel and burned. Upon combustion of the fuel and gas mixture the fumes are subjected to heat therefrom and completely eliminated from the effluent gases.



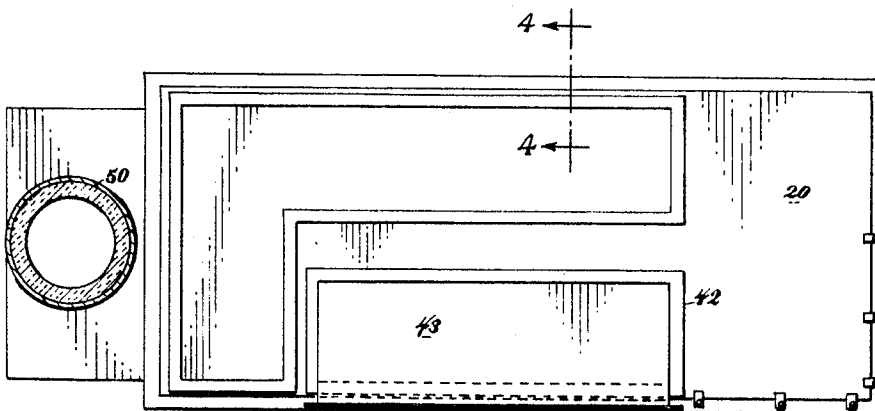
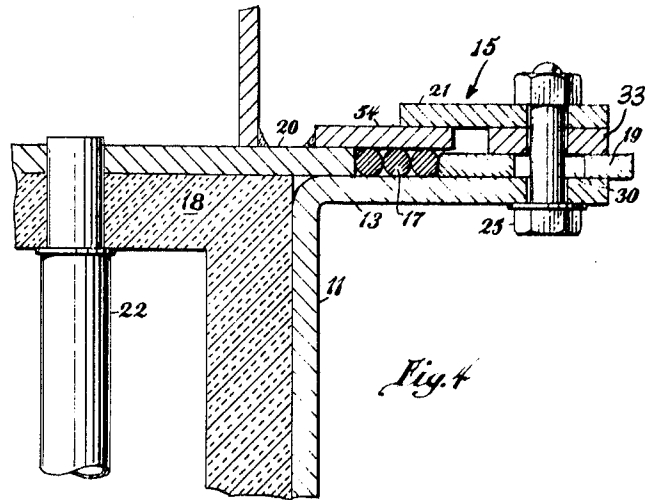
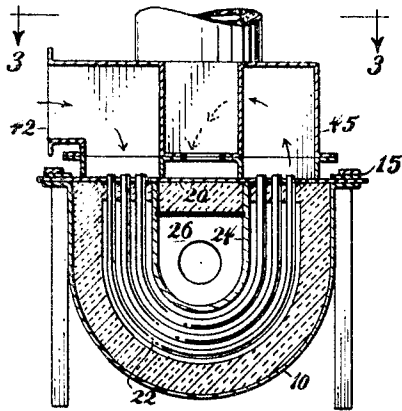
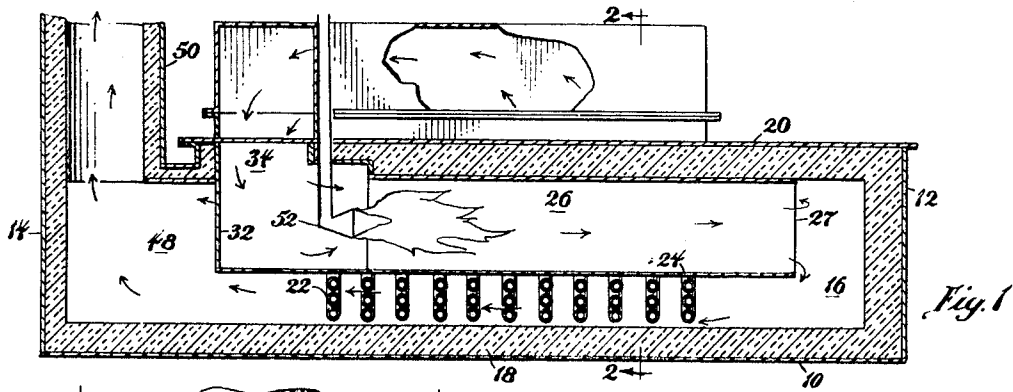


Fig. 3

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FUME INCINERATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a fume incinerator having a unique structural arrangement whereby excessive thermal variations within the incinerator that result in differential expansion and construction of the several parts thereof are permitted without attendant distortion effecting leakage of the gas and air that may lower the efficiency of the incinerator.

2. Description of Prior Art

The use of incinerating apparatus for the burning of obnoxious or harmful fumes has been and is now an accepted method of removing fumes from exhaust gases before the purged exhaust gases are vented to the atmosphere.

U.S. Pat. Nos. 3,251,656 and 3,353,919 show apparatus of this type having heat exchangers which utilize waste heat from such a combustion process for preheating fume-bearing air for combustion supplied thereto. Although apparatus of the type defined may be made to perform the desired operation, excessive thermal variation inherent in apparatus of the type defined herein produces an amount of expansion and contraction that soon causes cracking and loosening of welded joints, leakage of gases and a lowering of efficiency or a complete failure of the system.

SUMMARY OF THE INVENTION

This invention therefore provides a fume incinerator which concentrates deformation resulting from thermal expansion and contraction thereof in a single plane in which novel expansion joints may be located to permit relative movement of the several integral parts without causing breakage of the connecting joints, leakage of gases and breakdown of the system.

The chief objective of my invention therefore is to provide an arrangement for a fume incinerator which permits complete combustion of obnoxious fumes while requiring but a minimum of maintenance for continuous and long-lived operation.

A BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevation of a direct flame fume incinerator involving the invention,

FIG. 2 is a cross-sectional view as seen from lines 2—2 of FIG. 1,

FIG. 3 is a top plan view of the device of the invention, and

FIG. 4 is an enlarged view of the novel expansion joint comprising the invention as seen from line 4—4 of FIG. 3.

In a fume incinerator according to this invention an arched casing 10 is provided with end plates 12 and 14 to provide a housing enclosing a chamber 16 therein that is suitably insulated from the outside space by a layer of insulating material 18.

A plate 20 including a multiplicity of spaced apertures to which are secured arched or U-shaped tubes 22 substantially concentric with housing 10 in the manner shown by FIG. 2 of the drawing is secured to the open side of the casing 10. A similarly arched casing 24 having a radius of curvature somewhat less than that of the innermost of the U-shaped tubes fits inside the curvature of said tubes and is also secured to the plate 20 to provide a combustion chamber 26 whose open end 27 is spaced from the end plate 12 sufficiently to provide an end passageway through which gases exhausting from the combustion chamber 26 may pass to return over the U-shaped tubes 22.

The opposite end of the casing 24 is provided with a plate member 32 which is secured to the ends of the casing and to the underside of plate 20 whereby the combustion chamber 26 is closed on all sides but the open end 27.

A process gas from any predetermined source is directed to the inlet duct 42 having direct access to port 43 and to the top of the apertured plate 20 to which the U-shaped tubes are connected.

The top side of plate 20 is also attached to an L-shaped duct 34 which receives gases exhausting from tubes 22 and directs them to an inlet duct 45 secured to the plate 20 whereby they may be subjected to the combustible mixture burning in the chamber 26. Thus the hot gases exhausting from the chamber 26 make a U-turn and pass over the exterior of the arched tubes 22 and heat the gases passing therethrough. After giving up a substantial portion of their heat to the gases in the tubes, the purged and cooled gases are exhausted to a plenum chamber 48 and exhaust stack 50.

A burner 52 having a source of fuel outside casing 10 is provided at the closed end of the combustion chamber 26 adjacent the inlet for the heated process gas. The burner may be of any suitable type that conventionally utilizes the oxygen available in the exhaust gases, although additional air for combustion may be readily supplied, if conditions warrant, from an independent source. As the fuel is burned in chamber 26, the temperature in the combustion chamber rises rapidly and the obnoxious fumes therein are substantially eliminated.

The apertured cover plate 20 and shape secured to the arched casing 10 by a sealing means, the details of which are shown in FIG. 4. The apertured plate 20 is accordingly cut to a size and shape that overlaps the upright wall 11 of the casing 10 but ends considerably short of the outer extremity of flange 13. A plane member 54 is welded to the upper face of the plate 20 and extends outward from the subjacent outer end thereof a distance sufficient to form between it and the outer flange 13 of the casing 10, a sealing groove having a depth sufficient to receive a flexible packing 17 that precludes the leakage of gases between the cover plate and the casing to the atmosphere.

The packing 17 is adapted to be tamped or compressed tightly into the sealing groove to produce an effective seal by striking the end of the packing bar 19 which extends outward from the end of the flange and abuts the packing 17 at the other. Inasmuch as the packing bar extends outward from flange 13 it may be moved into the sealing groove and packed therein by simply striking it at any time to thus provide a suitable density for the packing to preclude leakage from the atmosphere into the combustion chamber.

The packing bar 19 is held against the flange 13 of casing 10 by a holddown tab 21 which overlaps the member 54 and is drilled to receive the holddown bolt 25. A spacer 33 is provided to abut the packing bar and increase the resistance of the sealing arrangement to the leakage of high-pressure fluid.

The packing bar 19 is provided with an opening 30 having a diameter substantially larger than the shank of holddown bolt 25 whereby the packing bar 19 may be moved laterally inward against the flexible packing 17 without interference from the bolt 25.

In operation a process gas containing the harmful or obnoxious gas is admitted to the fume incinerator through the inlet duct 42 whereupon it passes through the apertures of plate 20 to the arched tubes 22 where the gases are heated greatly by the gases of combustion exhausting from the combustion chamber 26.

As the process gases traversing the tubes 22 are further heated they are exhausted therefrom into the chamber 34 at the inlet of the combustion chamber. Here the hot process gases containing obnoxious fumes and air for combustion are mixed with fuel and burned. Hot exhaust gases are directed out the combustion chamber, over tubes 22 to the plenum chamber 48 and exhaust stack 50.

Inasmuch as the tubes are arched so the ends thereof may be secured to a plate 22, and the casing 24 is similarly arched and secured to the same plate, substantially all differential expansion of the device between the casing and perforated plate is limited to a single plane and the only location that the casing and perforated plate are connected to one another is at the flange around the periphery thereof. Thus, an expansion joint at this location as defined in this invention provides effective sealing arrangement and complete freedom for differential expansion therebetween.

While this invention has been described with reference to the drawing it is understood that various modifications in structure as well as changes in the precise manner of operation may be made without departing from the spirit of the invention. Therefore, it will be understood that the disclosure as contained herein is illustrative only and is to be limited only by the scope of the appended claims.

I claim:

1. A fume incinerator for eliminating obnoxious fumes from a gas comprising an arched casing having an open side and closed ends, a plate closing the open side of said casing apertured to provide a plurality of laterally spaced inlets and outlets for obnoxious gas together with means for directing said gases to a burner therein and means for exhausting said gases therefrom, an arched plate having opposite edges thereof secured to the apertured plate intermediate the inlets and outlets for the obnoxious gases to form a combustion chamber within the arched plate and a heating chamber intermediate

the arched plate and the arched casing, a plurality of arched tubes in the heating chamber secured at opposite ends to the apertured plate and arranged to surround the combustion chamber, a gas burner within the combustion chamber, a source of fuel, means directing the fuel to the burner, and an expansion joint surrounding said apertured plate and lying in a single plane connecting the casing to the apertured plate adapted to permit relative movement while precluding fluid flow therebetween.

2. A fume incinerator for eliminating obnoxious fumes from a gas as defined in claim 3 wherein the expansion joint comprises sealing material intermediate the apertured plate and the casing, closure means securing the perforated plate to the casing, and an independent adjusting bar abutting the sealing material on one side and the atmosphere on the opposite side thereof to permit continuous tamping of the sealing material.

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