ABSTRACT

A low-pollution trash incinerator with a superimposed flue, secondary chamber, and primary chamber in generally vertically extending coaxial relation. Each chamber has a burner unit therein and a blower supplies atmospheric air to the primary chamber to support the combustion of waste material therein. In one form of the incinerator a portion of the products of combustion in the secondary chamber are recirculated through the chambers of the incinerator.

9 Claims, 4 Drawing Figures
TRASH INCINERATOR WITH AFTER BURNER

This invention relates to trash incinerators for waste materials such as paper, cardboard, pasteboard, wood, garbage, histological tissue, and other trash and refuse. The combustion process in the usual trash incinerator produces large quantities of combustion products such as partially burned gases, smoke, soot, and other particulate contaminants which are discharged into and pollute the atmosphere.

Objects of this invention are to provide a trash incinerator which substantially decreases the pollution of the atmosphere resulting from the burning of waste material therein, protects persons charging the incinerator with waste material from the intense heat produced by waste material already being burned therein, is of economical construction and assembly, and is substantially maintenance and service free.

These and other objects, features and advantages of the invention will be apparent from the following description, appended claims and accompanying drawings in which:

FIG. 1 is a side view of a trash incinerator embodying this invention with portions broken away to illustrate some of the components thereof.

FIG. 2 is a sectional view on line 2-2 of FIG. 1.

FIG. 3 is a side view of a modified form of a trash incinerator embodying this invention with portions broken away to illustrate some of the components thereof.

FIG. 4 is a sectional view on line 4-4 of FIG. 2.

Referring in more detail to the drawings, FIGS. 1 and 2 illustrate a trash incinerator 10 embodying this invention with a generally cylindrical secondary combustion chamber 12 superimposed over a larger generally cylindrical primary combustion chamber 14. Preferably, the volume of secondary chamber 12 is in the range of about one-tenth to one-third of the volume of primary chamber 14.

A chimney or flue 16 with a spark arrester or bonnet 18 on its upper end is mounted on the upper end of secondary combustion chamber 12. Combustion chambers 12 and 14 have outer skins of sheet metal 20 and 22 with a fire and heat resistant lining 24 of a ceramic material cast in place therein. Waste material is placed in primary chamber 14 through an opening 26 in the side wall thereof which is covered by a charging door 28, and ashes are removed from the primary chamber through an opening 30 in the side wall adjacent the bottom thereof which is covered by a clean-out door 32. Charging door 28 is pivotally mounted adjacent its upper horizontal edge on incinerator 10 by brackets 34 and a pivot pin 36 so that the door shields an operator charging waste material into the incinerator from the intense heat produced by waste material already burning therein. Preferably, bottom wall 38 of chamber 14 is imperforate and the waste material is placed in the center of chamber 14 directly on the bottom wall thereof.

A burner unit 40 is mounted in the side wall of primary chamber 14 and inclined slightly vertically upwardly to direct an open flame and a stream of hot gases onto waste material received in the bottom of the primary chamber. A burner unit 42 is mounted in the side wall of secondary chamber 12 adjacent the lower end thereof to direct an open flame and hot gases into the products of combustion received from the primary chamber. Preferably, burner units 40 and 42 are identical and each has a blower 44 driven by an electric motor 46 to produce a stream of atmospheric air which is mixed with a fuel such as natural gas or liquefied petroleum gas. The mixture of atmospheric air and fuel is ignited and burns with an open flame to produce hot gases which are discharged in a stream through a blast tube 48 along the axis 50 or 52 thereof, respectively. The axis 50 of the stream of hot gases produced by burner unit 40 is inclined slightly upwardly above a horizontal plane and the axis 52 of the stream of hot gases produced by burner unit 42 is inclined generally downwardly below a horizontal plane at an angle in the range of about 15° to 35° and preferably at about 25°.

Each unit has a separate ignition transformer and a safety relay which closes down and prevents opening of the main automatic fuel supply valve if an ignition flame is not present or a flame failure occurs during operation of the unit. Suitable commercially available burner units having a maximum output of 800,000 BTU's per hour with a fuel of natural gas are sold under the trade name "Incinomite" as Model J-80-3 by Mid-Continent Metal Products Co., 2717 North Greenview Avenue, Chicago, Ill. 60614.

A blower 54 mounted on incinerator 10 discharges atmospheric air into primary chamber 14 to support the combustion of waste material therein. Blower 54 is driven by an electric motor 56 mounted thereon. The outlet of blower 54 is connected to a duct 58 opening into the lower portion of chamber 14 through the side wall thereof adjacent its outer periphery to impart a generally circumferential swirl to the stream of air discharged therefrom along with waste material received in the central portion of the bottom of primary chamber 14.

The inlet 60 of blower 54 communicates with atmospheric air through an inlet chamber 62 having a plurality of fixed louvers 64 which control and limit the amount of air discharged by a blower 54 into primary chamber 14.

FIGS. 3 and 4 illustrate a modified trash incinerator 10' embodying this invention in which blower 54 is arranged to draw a portion of the gases from secondary chamber 12 and discharge them along with atmospheric air through duct 58 into primary chamber 14 to recirculate gases from the secondary chamber through the chambers 14 and 12. The inlet of blower 54 is connected with secondary chamber 12 through a hood 66, communicating with secondary chamber 12 above burner unit 42 and below chimney 16, which is connected to inlet chamber 62 of the blower by ducts 68 and 70. Except for the addition of hood 66 and ducts 68 and 70, the structure of trash incinerator 10' is the same as trash incinerator 10 of FIGS. 1 and 2.

In operating trash incinerator 54 the charging door 28 is pivoted to the open position, waste material is placed in the bottom of incinerator 10 through opening 26, and the door is closed to seal the opening. Burner 40 is ignited and blower 54 turned on to initiate and support the combustion of waste material in primary chamber 14, and burner unit 42 is ignited to further burn the products of combustion produced by the waste material to minimize the contaminants escaping to the atmosphere through flue 16 and spark arrester 18. The products of combustion produced in primary chamber 14 by the burning of waste material pass generally vertically or axially upwardly into secondary chamber 12 where they are subjected to the further heat and open flame produced by burner 42 to more completely burn these products of combustion before
they escape to the atmosphere through flue 16 and spark arrester 18. The downwardly directed flow of hot gases produced by burner 42 is believed to retard the upward flow of contaminants through secondary chamber 12, thereby increasing the time during which such contaminants are subjected to intense heat within chambers 12 and 14 to more completely oxidize or destroy such contaminants and thereby decrease the amount of pollution of the atmosphere by the burning of waste material in incinerator 10. With some dry waste materials, such as paper, rags, and wood, it may not be necessary to continue to operate burner unit 40 to supply additional heat in the primary chamber after such waste materials have been ignited therein by the burner unit.

Trash incinerator 10 operates in generally the same manner as trash incinerator 10 except that blower 54 also draws off part of the products of combustion which have passed upwardly through chamber 12 beyond burner unit 42, mixes such products of combustion with additional atmospheric air in chamber 62, and discharges such mixture into the bottom of primary chamber 14 via duct 58 for recirculation through primary chamber 14 and secondary chamber 12. This recirculation increases the exposure of the products of combustion to the intense heat within chambers 14 and 12 which is believed to increase the efficiency of trash incinerator 10 and decrease the pollution of the atmosphere by the burning of waste materials therein.

Trash incinerators embodying this invention with a secondary chamber superimposed on a primary chamber and having a separate forced air burner in each chamber are believed to substantially decrease the pollution of the atmosphere by the burning of waste material therein and may be readily operated by unskilled personnel. The pivotal mounting of the charging door adjacent its upper horizontal edge protects personnel charging waste material into incinerators embodying this invention from the intense heat produced by waste material already being burned therein. The generally vertically extending superimposed coxial arrangement of the flue, secondary burner, and primary burner provides trash incinerators embodying this invention which have only a few component parts and are of economical construction and assembly and substantially maintenance free.

I claim:

1. A trash incinerator comprising a primary combustion chamber adapted to receive combustible waste material therein, a secondary combustion chamber superimposed over said primary combustion chamber and in communication therewith to receive therefrom the products of combustion of waste material in said primary chamber, a flue having an inlet connected to said secondary chamber adjacent the upper end thereof, and an outlet opening to the atmosphere above said secondary chamber, discharge means for discharging gases into said primary chamber adjacent combustible waste material received therein, a first blower having an inlet adapted to receive atmospheric air and an outlet connected to said discharge means, a first burner providing heat and an open flame in said primary chamber to at least partially burn combustible waste material in said primary chamber, and a second burner having a second blower discharging into said secondary chamber a stream of atmospheric air and a combustible fuel which burns with a flame to provide heat in said secondary chamber to more completely burn therein products of combustion produced by the at least partial burning of combustible waste material in said primary chamber, said second burner being constructed and arranged to discharge said stream of atmospheric air and combustible fuel generally horizontally into said secondary chamber below and generally across the connection of said inlet of said flue with said secondary chamber, whereby pollution of the atmosphere by burning waste material is decreased.

2. The trash incinerator of claim 1 wherein said primary combustion chamber has a larger volume than the volume of said secondary chamber.

3. The trash incinerator of claim 1 wherein the volume of said secondary chamber is in the range of about one-tenth to one-third of the volume of said primary chamber.

4. The trash incinerator of claim 1 wherein said flue, said secondary chamber, and said primary chamber are superimposed one over the other on substantially the same generally vertical axis.

5. The trash incinerator of claim 1 wherein said discharge means discharges gases into said primary chamber in a generally horizontal stream to swirl generally circumferentially around the outer periphery of combustible waste material received in said primary chamber.

6. The trash incinerator of claim 1 wherein said stream of atmospheric air and fuel is discharged by said second burner downwardly into said secondary chamber at an angle in the range of about 15° to 35° below the horizontal.

7. The trash incinerator of claim 1 which also comprises; a means for returning some of the products of combustion received in said secondary chamber to said primary chamber to recirculate such products of combustion through said chambers.

8. The trash incinerator of claim 7 wherein said last-mentioned means comprises a conduit having an inlet connected to said secondary chamber above said second burner and below the connection of said inlet of said flue with said secondary chamber.

9. The trash incinerator of claim 8 wherein said conduit has an outlet communicating with the inlet of said first blower for receiving a portion of the products of combustion in said second chamber and discharging said products of combustion through said discharge means into said primary chamber for recirculating products of combustion through said chambers.

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