INCINERATOR FOR REFUSE MATERIAL

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ABSTRACT

An incinerator apparatus having a feed opening at one end for receiving waste products to be incinerated and having a suction means at the other end to create a negative pressure within the incinerator; that is, a pressure slightly lower than the existing outside atmospheric pressure, and to insure a desired and constant flow of the products of combustion from a primary combustion chamber, through a secondary combustion chamber, through an expansion chamber, through a settling chamber and into the atmosphere through an exit stack.

The primary combustion chamber has the means to increase the normal combustion temperature by thermal radiation and heat reflection so as to appreciably incinerate all combustibles and appreciably reduce in volume the non-combustible matter present and the secondary combustion chamber has the means to utilize thermal radiation and heat reflection to incinerate the unburned volatile and volant combustibles from the first combustion chamber as they pass through the chamber.

9 Claims, 1 Drawing Figure
INCINERATOR FOR REFUSE MATERIAL

This invention relates generally to incinerators and includes a casing having a feed opening at one end for feeding waste products to be incinerated and having a suction means at the other end to insure a desired and constant flow of the products of combustion toward the other end of the incinerator for discharge, and includes a primary combustion chamber adjacent and below the feed opening and a secondary combustion chamber connected at one end to the primary combustion chamber and connected at the other end to an expansion chamber which is in turn connected to a settling chamber and to the suction means for exhaust of the remaining completely burned gases to exit into a stack and into the atmosphere.

It is an object of this invention to automatically burn all combustible materials charged into the incinerator as well as to appreciably reduce in volume the non-combustible materials by maintaining the combustion with a desired under-hearth air charge and by increasing the normal combustion temperature with thermal radiation and reflected heat within the primary burning chamber.

A still further object of this invention is to provide a primary combustion chamber in the incinerator that is designed to control the burn within this combustion chamber, permitting a desired low pressure under-hearth air flow into the first burn as well as using thermal radiation and heat reflection to return much of the upward radiating heat back into the burn so as to raise the overall temperature for combustion and to simultaneously produce volumetric reduction of all non-combustible matter within the incinerator.

A still further object of this invention is to provide a primary combustion chamber in the incinerator that is designed to control the burn within this combustion chamber and in addition provide a reduced throat area at the exhaust end of the primary combustion chamber to slow down the movement of the unburned volatile and volatil combustibles within the primary combustion chamber and retain a maximum temperature within the primary combustion chamber during the first burn as well as increase the temperature at the reduced throat area.

A still further object of this invention is to provide an element so positioned and retained over the primary combustion chamber that it provides a physical separation between the primary combustion chamber and the secondary combustion chamber and is so positioned in an angular direction as to enable the element to absorb the heat of combustion from the primary combustion chamber and the secondary combustion chamber and simultaneously to emit thermal radiation and reflected heat downward into the primary burn area to raise the temperature therein and assist in the volumetric reduction of the non-combustible matter present therein and to emit thermal radiation and reflected heat upward into the secondary burn area to raise the temperature therein and assist in the incineration of those unburned volatile and volatil combustibles therein that escaped from the primary combustion chamber.

A still further object of this invention is to provide an element so positioned and retained over the primary combustion chamber to control the flow of the combustibles from the first burn into the secondary burn in their flow path through the incinerator.

It is a further object of this invention to automatically burn all combustible material charged into the incinerator as well as to volumetrically reduce all possible non-combustible material charged into the incinerator by maintaining the combustion with a desired low pressure under-hearth air feed under the first burn chamber so that the combustion will be supported and providing a governed speed suction means at the opposite end of the incinerator to draw the burning gases and unburned gases, smoke and fly ash from the first burn chamber through a second afterburn chamber through an expansion chamber and with said suction means drawing the gases through a screen into a settling chamber and exhausting them through said suction means to a stack for emission into the atmosphere as a clean, acceptable exhaust.

Further objects of this invention shall be apparent by reference to the accompanying detailed description and the drawing in which

FIG. 1 is a schematic cross sectional elevation of an incinerator.

Referring to the drawing there is illustrated a cross sectional elevational view of an incinerator 10 which is comprised of an enclosing housing 11, the housing 11 including a base 12 upon which the incinerator rests, an end wall 14 enclosing the front end of the incinerator, a top enclosure 15 and side walls 16 and a back wall 17. An opening 18 is provided at one end in the form of a chute to permit dumping the refuse into the incinerator. A pivoted gate 19 is provided so that it will normally, by gravity, hang in a closed position but will swing open with the pressure of the refuse flowing through the chute 18. Below the chute 18 there is provided a refractory supported bed 20 to receive the refuse from chute 18. The bed 20 may be of the normal type of movable segment bed or reverbatory stoker as utilized in other incinerators in which the bed is formed in a stepped formation and each step or segment is movable by a rod extending out of the incinerator so that as the refuse falls upon a step of the bed by means of the rods the step may be pushed forward to clear the refuse off the top of each adjoining step. Thus the incinerated and volumetrically reduced remains of the burning refuse will be pushed forward from step to step ending up at the end of the bed to drop into a receiving chamber 21 which is provided with means at one end for cleaning out when necessary. Also, to be included is a pivoted door 22 which will be spring pressed closed except when the material falling upon the door will press the door open to allow the refuse to fall into the receiving chamber. A refractory wall 23 extends upward from chamber 21 and an overhead portion 24 extends slightly above horizontal to thus form an enclosure that is a portion of the secondary incineration chamber 34 and receives the unburned volatile and volatil combustibles from the primary incineration chamber 29. Also, to divide the area of the initial burn from the secondary burn, there is provided a steel element 25 that completely covers the primary burn chamber 29 and that must be located at a predetermined position so that the end 25A of the element provides a reduced throat area for the passage of the unburned volatile and volatil combustibles which are the escaping high temperature heat and gaseous by-products of combustion. To assist in producing an initial burn of the refuse, there is provided a properly designed low pressure air feed underneath the refractory supported
In this instance, a fresh air blower 26 is mounted in a chamber 27 and connected through a duct 28 to the space under the bed 20 which has air flow holes to permit desired fresh air to flow through the material to be incinerated and into the first burn chamber 29.

To insure the movement of the volatile and volant matter from the combustion of the refuse, there is provided a suction fan 30 driven by a motor 31 mounted in an exhaust stack 32 and the exhaust stack is connected to the incinerator through an intake opening 33 in the back wall 17. Thus, with the operation of the suction fan 30, the volatile and volant matter from the primary burning chamber 29 will be drawn through the reduced open throat area under the end 25A of plate 25. This matter will be drawn upward as indicated by the arrows and into a second burn or after-burn chamber 34. To assist in the controlled flow of the volatile and volant matter, a refractory shield 35 may be positioned as illustrated and supported from the wall 21 and a second shield 36 may be positioned as illustrated and supported from the top wall 15. Thus, the flow of the matter will be through the secondary combustion chamber 34. It is to be noted that plate 45 at its forward end provides a reduced throat area 45A through which the exhausting matter must pass to the expansion chamber 37.

To assist the second burn in the area 34, a blower 38 is positioned upon the top 15 and connected by a duct 39 to the secondary combustion chamber 34. This blower is controlled to increase the oxygen feed into the secondary combustion area, particularly for hard-to-burn materials. This fresh air flow from the blower 38 is introduced into the flow of the volatile and volant matter from the primary burn chamber 29 and produces a resultant diffusion of the flowing matter from the primary combustion zone 29. This produces an atmosphere of high temperature so that said diffusion is highly conductive to spontaneous combustion of the matter flowing through the secondary combustion chamber 34. Peeperholes 40, 50 and 60 are positioned in side 16 so that observation of the burn may be made at any time. The unburned matter from the secondary combustion chamber 34 will continue to pass as indicated by the arrows through a reduced throat area 45A and into chamber 37 wherein expansion and change in direction facilitates combustion of the remaining unburned volatile and volant combustibles and through a stationary fine mesh screen 41 with high resistance to temperature, such as Monel stainless steel metal. The stray combustibles will more or less complete the incineration process as they pass into the settling chamber 42 where the products of combustion pass through the opening 33 and into the stack 32 to be exhausted into the atmosphere as illustrated by the arrows. To assist the secondary burn, a steel plate 45 may be affixed to the refractory wall 24 and extend at an angle therefrom to produce a reduced throat area 45A. The steel plate 45 will become heated by the burning gases and will in turn emit thermal radiation and heat reflection upward and into the secondary burn in chamber 34.

Referring to the metal plate 25, this is of primary importance to the operation of the incinerator, that is, it is to provide an enclosure for the first burn chamber, a physical separation between the first and second burn chambers, and to provide a directional flow of the volatile and volant combustibles leaving this chamber but more important it is to be constructed of a material such as a low carbon, hot rolled steel or of a particular designated sheet or plate specified as ASTM 36 which is capable of retaining its physical structure without any disintegration up to 1,600°F for 100 intermittent hours. Other metal elements may be utilized, such as Armco 18 SR sheets and plates capable of maintaining its physical structure up to 1,400°F for 535 hours. This particular element is to be supported wherever necessary, as in FIG. 1, by rods (not shown) from the roof through the center of the element, and it will be supported on either side by the grooved wall 16. It will be attached at one end to the roof or upper wall 15 and it may be braced at its lower end 25A and may be attached to the element 36 at a point 36A. Thus, although the plate 25 may be heated to a bending temperature, the supports are provided to retain its position as illustrated. The plate 25 will be heated to a bright cherry glow and thus a great deal of heat normally lost in the area in current incinerators will be thermally radiated and reflected down into the primary burn and up into the secondary burn and the plate 25 will act as a catalyst to absorb heat from both the first and second burn and producing a steady state of bright cherry glow throughout both burn areas. The incinerator is not designed for continued uninterrupted use, but rather is designed for periodic shutdown. This is to insure element replacement as needed. Although plate 25 is designed for a reasonably long period of operation, plate 25 and plate 45 are mounted so that they may be easily removed and replaced through slots 46 and 47; slots 46 and 47 being filled with refractory cement after each installation.

The invention described in detail in the foregoing specification is subject to changes and modifications without departing from the principle and spirit thereof. The terminology used is for purposes of description and not of limitation; the scope of the invention being defined in the claims.

What is claimed is:

1. An incinerator including: an elongated casing having means at one end for feeding combustible material therein and a metal element dividing said casing into a first burn chamber at the end wherein said combustible material is received, and a second burn chamber connected to but physically separated from the first burn chamber and spaced from said first burn chamber to receive the unburned volatile and volan combustible products from the second burn, and an expansion chamber connected to but spaced from said second burn chamber and a settling chamber connected to but spaced from said expansion chamber to receive the combusted products from the second burn and an air suction means at the far end of said casing to insure the flow of all volatile products from the first burn of the material introduced into the incinerator; said first burn chamber having a desired low pressure air feed under the area of combustion and said metal element over said area of combustion to absorb and thermally radiate and reflect a high percentage of the heat of combustion from the first burn chamber back into the first burn to raise the temperature thereby to assist in thoroughly incinerating all possible solid, liquid and gaseous combustibles and appreciably reduce in volume those non-combustible products present; said sec-
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5. In a device according to claim 1 wherein the metal element is a hot rolled, low carbon steel composed of plate stock to act as a catalyst.

6. In a device according to claim 2 in which the heat absorbing and thermally radiating steel elements in the first and second burn chambers are retained in a desired rigid and supported configuration.

7. In a device according to claim 2 in which the heat absorbing and thermally radiating steel elements in the first and second burn chambers are removable and replaceable without dismantling the incinerator.

8. In a device according to claim 1 in which the metal element in the first burn chamber is positioned over the primary combustion chamber in an angular relationship to the supporting bed of the combustible material to form a reduced throat area at the exit end of the primary burn chamber through which the volatile and volatant combustibles of the first burn are directed by the suction means to pass into the second burn chamber and wherein the primary reduced area raises the temperature of the escaping volatile and volatant combustibles and compresses same.

9. In a device according to claim 1 in which the metal element in the second burn chamber is positioned in an angular relationship to the incinerator ceiling to form a reduced throat area through which the volatile and volatant combustibles from the first portion of the secondary burn are directed by the suction means to pass into the expansion chamber and wherein said secondary reduced throat area raises the temperature of the remaining escaping volatile and volatant combustibles and compresses same before exit into the expansion chamber.

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