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3,508,505 4/1970 Gatewood..... 110/8

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[54] INCINERATOR
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110/18 C

[51] Int. Cl..... F23g 7/00

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8 C, 18, 18 C

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ABSTRACT: An incinerator comprising a primary combustion chamber having a combustion gas outlet communicating with a secondary combustion chamber, an exhaust outlet from said secondary combustion chamber, burner means positioned to provide both heat of combustion to said primary combustion chamber and auxiliary heat in the vicinity of the gas outlet of said primary combustion chamber such that combustion gasses passing from the primary combustion chamber through said gas outlet must pass through auxiliary heat, an air supply to said primary combustion chamber and a secondary air supply in the said secondary combustion chamber.

Combustion of gasses escaping from the primary combustion chamber is completed by compressing the gasses into a highly concentrated form and ramming them under pressure into the secondary combustion chamber for burning. Advantageously, the air supply to the secondary combustion chamber is opposite to the entering concentrated gasses so that a reverse airflow is provided.

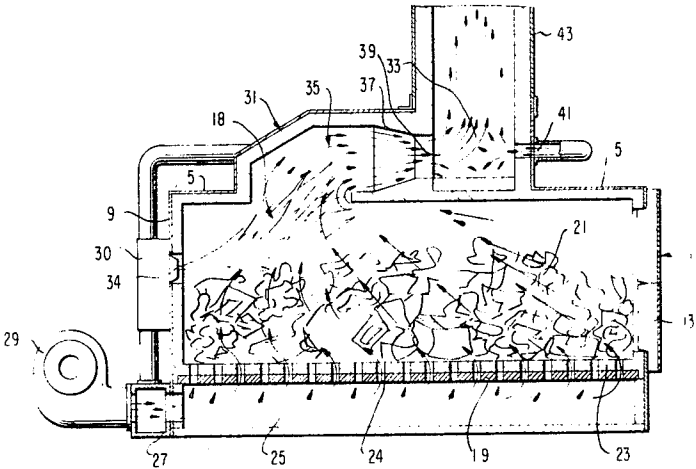


FIG 1

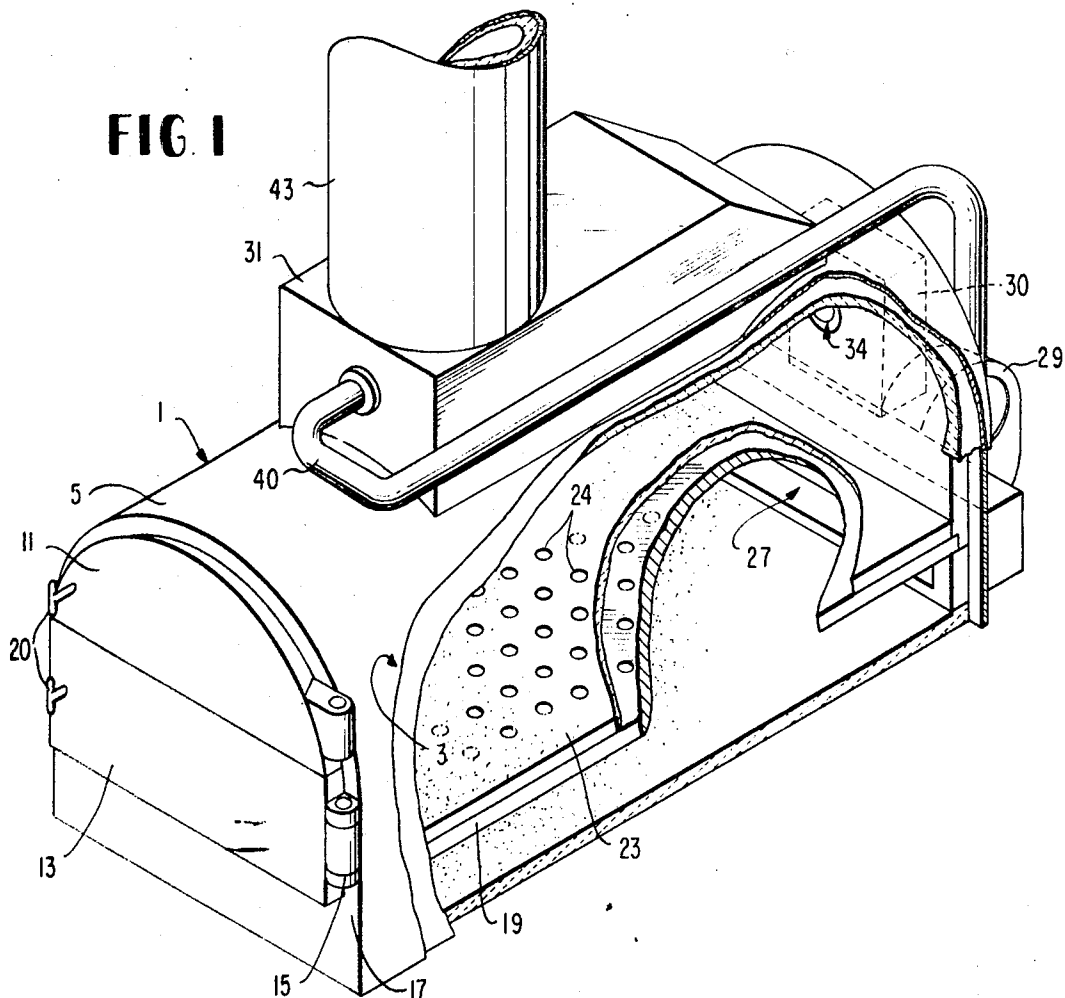
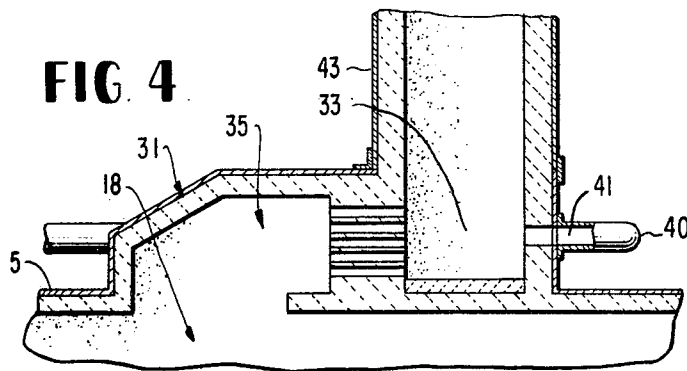


FIG 4



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FIG. 2

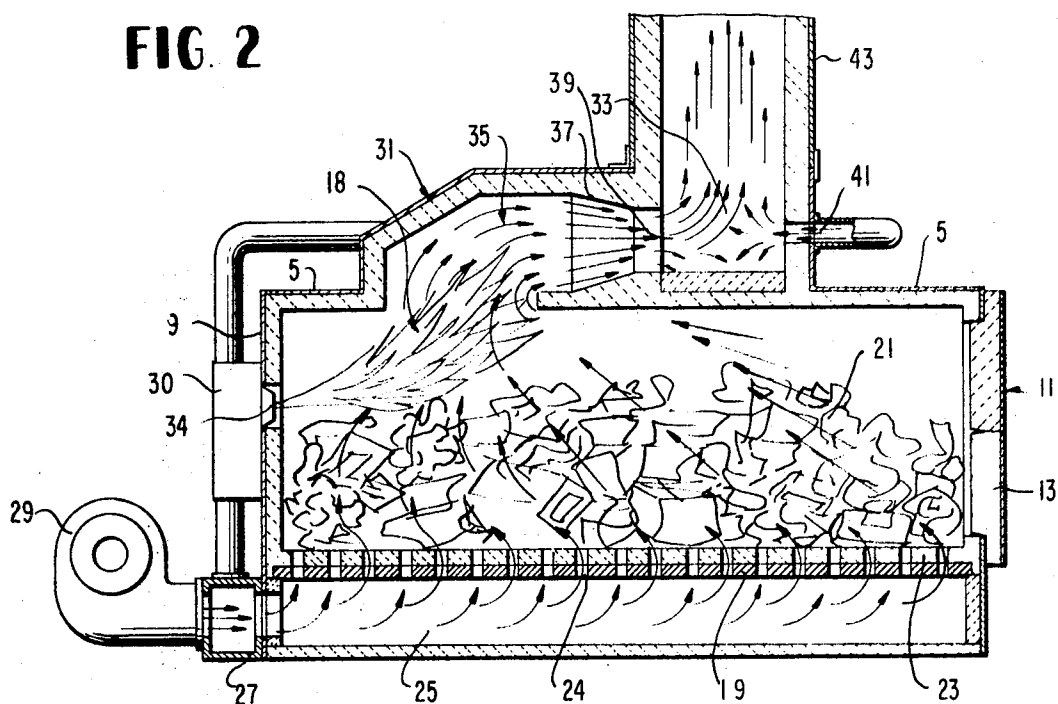
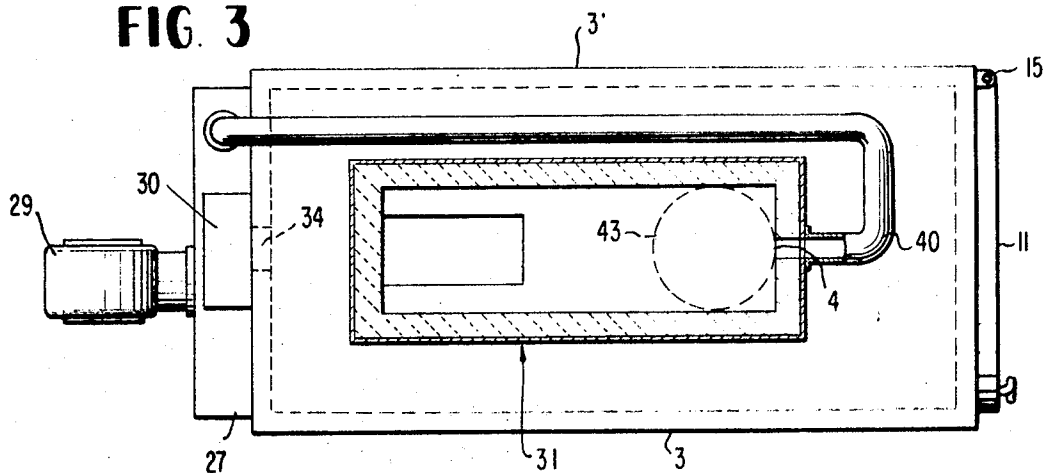


FIG. 3



1 INCINERATOR

This invention is concerned with a new and improved incinerator. More specifically, the invention is directed to an economical incinerator which effects rapid and complete combustion in a controlled manner.

The incineration of refuse or waste material is one of the prime contributors to air pollution. With ever-increasing population and growth densification both in urban and suburban areas, the air pollution problem is rapidly reaching critical proportions. As a result, increased pressures are being brought to bear upon both private and public sectors to step up efforts for control of the problem. Many localities are beginning to enforce compliance with existing requirements for reducing air pollution. Other jurisdictions have or are in the process of promulgating stricter laws or ordinances on the subject. Most recently, the Federal Government has announced plans for a general assault on environmental pollution.

One area to which attention has been directed for alleviating the problem is that of more efficient incineration. Most incinerators now in use have been criticized as failing to provide the complete and efficient combustion necessary to meet the air antipollution requirements. Others, although meeting the performance requirements are expensive and for many, economically restricting, if not prohibitive. Illustrative of these expensive incinerators are those comprised of multicom-bustion chambers each equipped with individual burners, air supply means, vent systems, etc. Accordingly, it is quite clear that a pressing need exists for a relatively cheap incinerator which offers complete and rapid combustion.

It has now been found that the aforementioned shortcomings of incinerators may be obviated by an incinerator comprising a primary combustion chamber having a combustion gas outlet communicating with a secondary combustion chamber, an exhaust outlet from said secondary combustion chamber, burner means positioned to provide both heat of combustion to said primary combustion chamber and accessory heat in the vicinity of the combustion gas outlet of said primary combustion chamber such that combustion gasses passing from the primary combustion chamber through said gas outlet must pass through said accessory heat, an air supply to said primary combustion chamber and a secondary air supply in said secondary combustion chamber. Thus, the incinerator of the invention needs but one burner means which performs a dual function: (1) It creates the heat in the primary combustion chamber necessary to dehydrate and combust refuse or other combustible materials therein and (2) To produce the heat near the vicinity of the combustion gas outlet so that escaping combustion gasses are heated to their combustion point and thereby readied for self-ignition.

In a preferred aspect of the invention, a passageway connects the combustion gas outlet of the primary combustion chamber and the inlet of the secondary combustion chamber, the passageway being provided with means for compressing the heated combustion gasses passing through the passageway into the secondary combustion chamber. The air supply to the primary chamber includes means such as blower means for introducing combustion supporting air into the primary combustion chamber. The blower means also serves to pressure escaping combustion gasses out of the primary combustion chamber through the passageway and out of the primary compression means provided therein into the secondary combustion chamber. Thus, the incinerator of the invention compresses the escaping hot gasses and forces them under pressure into the secondary combustion chamber for burning them in a highly concentrated form. Advantageously, the air supply to the secondary combustion chamber is positioned opposite the entry of the concentrated and pressurized combustion gasses so that a reverse airflow is provided. This reverse airflow creates a desirable air turbulence which effects scrubbing and a thorough mixing with oxygen. There is thereby provided a more efficient secondary combustion operation.

The primary combustion chamber of the incinerator may be provided with any of the conventional grates commonly em-

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ployed in incinerators. As a preferred embodiment of the invention, however, a perforated, refractory plate is employed instead of the usual grate. In this embodiment, the perforated refractory plate serves to direct airflow upward through the primary combustion chamber and to build up pressure beneath the primary combustion chamber so that entry of the air into the primary chamber is at a high velocity and in a jet-like fashion.

The invention will be further described with reference to the attached drawings wherein:

FIG. 1 is an elevational perspective of the incinerator;

FIG. 2 is a cross section of FIG. 1 taken along line A—A;

FIG. 3 is a top elevation of the incinerator;

FIG. 4 is a partial cross section of an embodiment of the invention employing a perforated diffuser as the compression means.

Referring to the drawings, the incinerator of the invention comprises a casing indicated generally as 1, including sidewalls 3 and 3' joined to one another at their top ends by an integral curved top wall 5 and at their bottom ends by a base 9 secured on bottom wall 7 by any suitable means such as, for example, welding, bolting, or the like. Alternately, the rear wall 9 may be integral with the side, top and bottom walls of the casing 1, if desired. Opposite the rear wall 9 is a door assembly comprised of an upper feed door 11 and a lower door 13, each hingedly secured by means of hinges 15 to one side of the front wall plate 17. The doors function to seal the casing 1 and render the same completely airtight. The door assembly is preferably provided with an inside liner (not shown) of of asbestos or other refractory insulation. Locking latches 20 of any suitable design or construction are provided as shown to ensure a tight locking of the door. The doors may assume any desired design and obviously a single door may be used instead of dual doors.

Casing 1 can be made of any suitable metal that will withstand the high heat generated therein. For example, the casing may be made of steel, steel alloys, heat-resistant iron and the like. A particularly preferred material is stainless steel.

Within casing 1, a short distance above base or bottom wall 7, there is provided a perforated baseplate 19 which together with sidewalls 3, 3', top wall 5, rear wall 9, front wall plate 17 and the door assembly 11, 13 defines a primary combustion chamber 21. The perforated plate is also preferably constructed of refractory material as casing 1. On top of base plate 19 is placed a grate 23 which may be a conventional grate, but is advantageously a perforated plate of refractory material. Suitable examples of the refractory material capable of withstanding high intense and prolonged temperatures are silica, fire clay, fused alumina, fused refractory material, kaolin refractory material, magnesite, mulite, refractory silicon, carbide, etc.

The baseplate 19 and the refractory grate 23 constitute the hearth of the primary combustion chamber 21. The base plate 19 together with the lower portions of the sidewalls 3, 3', rear wall 9, front wall plate 17 with the door assembly 11, 13 and bottom wall 7 define a sealed chamber 25 under the total hearth. On the rear wall 9, adjacent to and outside the sealed chamber 25 is located a combustion source air plenum 27. Attached to the air plenum is a blower means 29, preferably a high-pressure blower, for supplying air into the sealed chamber 25. The perforations in the base plate 19 and refractory plate 23 are in alignment so as to form communicating passageways 24 between the sealed chamber 25 and the primary combustion chamber 21. (See FIG. 2) The passageway defined by the perforations should be of a size small enough to create a build up of air pressure in the sealed chamber 25 so that air is introduced into the primary combustion chamber in a jetlike fashion. This jetlike vertical introduction of the air into the primary combustion chamber accomplishes more complete and even burning of all the refuse or combustibles in the combustion chamber as well as offers a more definite control of the quantity and rate of air introduced.

A burner means 30 is provided on the real wall 9 outside the primary combustion chamber 21 and is positioned to project a flame through burner nozzle 34 into the primary combustion chamber 21. The size and direction of the flame is controlled so that it covers the entire area of the combustion gas outlet or flue slot 18. Thus, the location of the burner means is such that it performs both the function of providing the heat of combustion in the primary combustion chamber 21 and the energy necessary to raise the heat of escaping gasses and smoke particles to their combustion point. The intensity of the heat emitted by the flame should be high enough to raise the temperature of the escaping gasses and smoke particles to this level. The actual temperature of the flame will vary, of course, depending upon the type of combustible material or refuse being burned, the pressure of the heated gasses and the oxidative conditions existing in the secondary combustion chamber. Although a flame-projecting burner may offer the most convenient source of heat for the invention, any heat source which provides the above-mentioned dual function is contemplated.

Situated on top of casing 1 is a housing indicated generally as 31 together with top wall 5 of the casing 1 defines both a secondary combustion chamber 33 and a passageway 35 which connects primary combustion chamber 21 with the secondary combustion chamber 33. The passageway is provided with a compression means 37 such as a funnel ram area (See FIG. 2) or a perforated diffuser (See FIG. 4). The compression means 25 acts to compress the hot gasses and smoke particles in this reduced area and to ram them under high pressure into the secondary combustion chamber 33.

The secondary combustion chamber 33, communicates with passageway 37 via inlet 39, which is substantially smaller in cross-sectioned area than is the combustion gas outlet 18 of the primary combustion chamber, and is provided with a secondary combustion air inlet 41 which is connected by air inlet tube 40 to combustion source air plenum 27. (See FIG. 2) Secondary combustion air inlet 41 is preferably located opposite inlet 39 so that the hot gasses entering secondary combustion chamber 33 at high velocity meet an opposing force of secondary combustion. By this arrangement not only is the oxygen need for secondary combustion supplied but the reverse airflow creates a turbulence in secondary combustion chamber 33 which combustion ensures thorough mixing and combustion. In addition, by controlling the velocity of the reverse airflow there is provided means for controlling the velocity of the incoming heated gasses and consequently control for the velocity of the exiting gasses.

Attached to housing 31 and communicating with secondary combustion chamber 33 is exhaust stack 43.

The inside walls of the primary combustion chamber 21, passageway 35, residual chamber 33 and at least a portion of exhaust stack 43 are preferably constructed of a refractory material such as desired above in connection with the grate or refractory plate 23 of the primary combustion chamber.

In operation the primary combustion chamber 21 is loaded with the waste material to be burned. This material may be dry, moist or wet and can be burned efficiently in the incinerator of the invention without means of fuel added thereto. The burner means 31 is ignited and adjusted to project a flame over the opening 18. Blower means 29 feeds air into sealed chamber 25 underneath the hearth where it builds up pressure and jets into primary combustion chamber 21 via the passageways 24 defined by the aligned perforations in baseplate 19 and the refractory plate 23. In addition to providing the air necessary to support the combustion in the primary combustion chamber 21 the jetting air moves in a generally vertical direction forcing combustion gasses and smoke particles through the controlled flame area into passageway 35. In passing through clean, hot gas flame provided by burner means 30, the gasses and smoke particles are heated to their

combustion point. In passage way 21 the combustion gasses are forced through the combustion means 25 and pressured via inlet 27 into the secondary combustion zone 23 wherein they meet head-on the air from the secondary combustion air source 29, the result is a turbulent effect in secondary combustion chamber 23 wherein the combustion gasses are scrubbed and a self-ignition of the mixture occurs to complete the combustion. The resulting gasses which are now free of carbon and other obnoxious air pollutants pass through the atmosphere out through the terminal upper end of the exhaust stack 43.

While there have been described herein at present considered preferred embodiments of the invention, it would be obvious that those skilled in the art than modifications and changes may be made therein without departing from the essence of the invention. It is therefore to be understood that the exemplary embodiments are illustrative only and not restrictive of the invention, the scope which is defined in the appended claims, and that all modifications that come within the meaning and range of equivalency of the claims are intended to be included therein.

It is claimed:

1. An incinerator comprising a primary combustion chamber, a secondary combustion chamber, said primary combustion chamber having a combustion gas outlet communicating with said secondary combustion chamber, an exhaust outlet from said secondary combustion chamber, burner means positioned to provide both heat of combustion to said primary combustion chamber and auxiliary heat in the vicinity of the gas outlet of said primary combustion chamber such that combustion gasses passing from the primary combustion chamber through said gas outlet must pass through said auxiliary heat, an air supply to said primary combustion chamber and a secondary air supply in the said secondary combustion chamber positioned to provide a reversed airflow into said secondary combustion chamber.

2. The incinerator of claim 1 wherein a grate is provided in the primary combustion chamber.

3. The incinerator of claim 2 wherein the grate is a perforated refractory plate.

4. The incinerator of claim 3 wherein the blower means is positioned to blow air up through said perforated refractory plate.

5. An incinerator comprising a primary combustion chamber, a secondary combustion chamber, said primary combustion chamber having a combustion gas outlet communicating with said secondary combustion chamber, an exhaust outlet from said secondary combustion chamber, burner means positioned to provide both heat of combustion to said primary combustion chamber and auxiliary heat in the vicinity of the gas outlet of said primary combustion chamber such that combustion gasses passing from the primary combustion chamber through said gas outlet must pass through said auxiliary heat, an air supply to said primary combustion chamber and a secondary air supply in said secondary combustion chamber positioned to provide a reversed airflow into said secondary combustion chamber, a passage way connecting the combustion gas outlet of the primary combustion chamber and the inlet of the secondary combustion chamber, said passage way being provided with means for compressing the heated combustion gasses passing through the said passage way into the secondary combustion chamber, said air supply to the primary combustion chamber including blower means.

6. The incinerator of claim 5 wherein the compression means is a ram funnel means.

7. The incinerator of claim 5 wherein the heat provided by the burner means is in the form of a flame projected over the gas outlet of the primary combustion chamber.

8. The incinerator of claim 5 wherein the compression means is a perforated diffuser.