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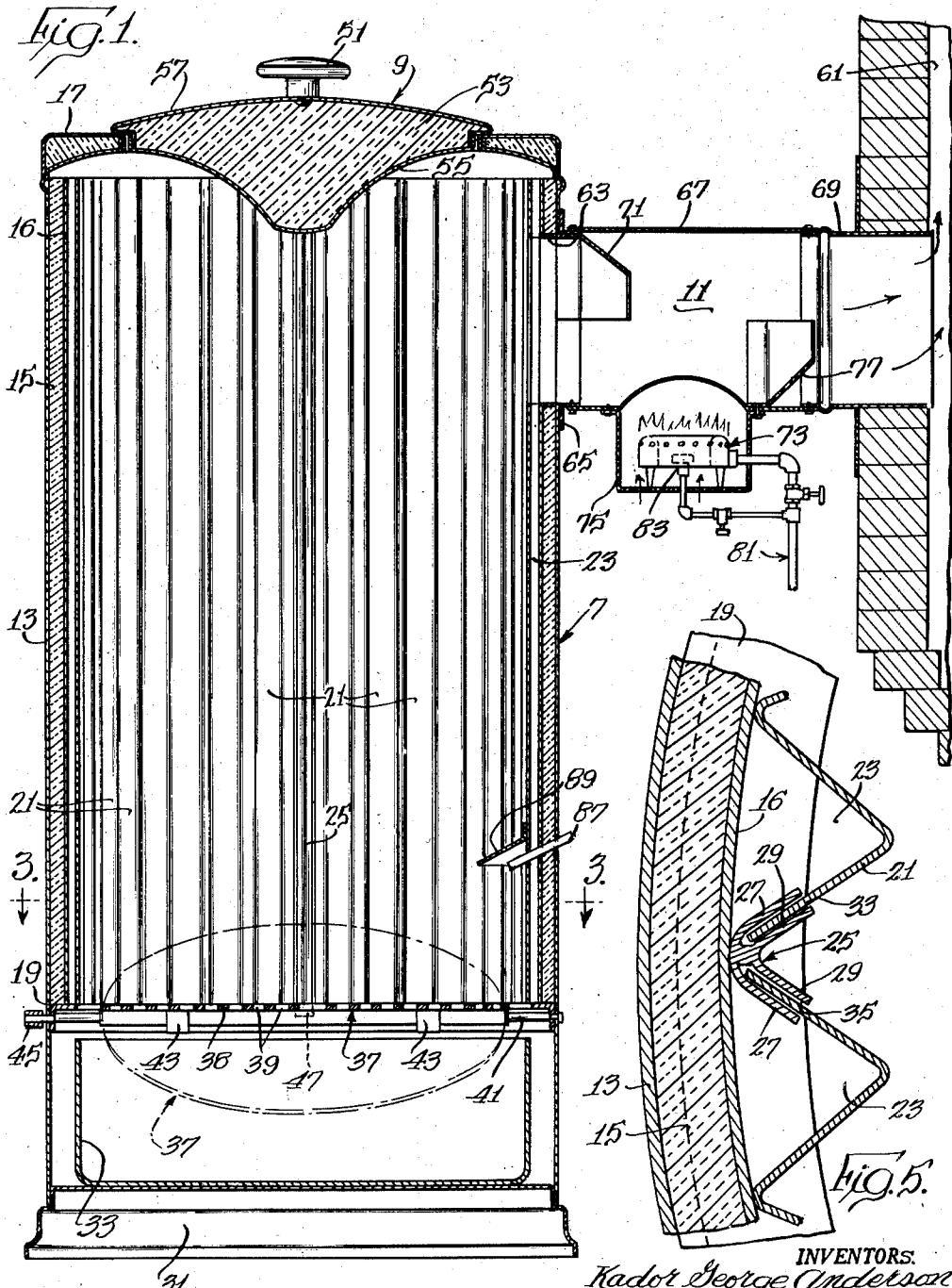
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2,863,406

INCINERATOR

Filed June 10, 1957

4 Sheets-Sheet 1



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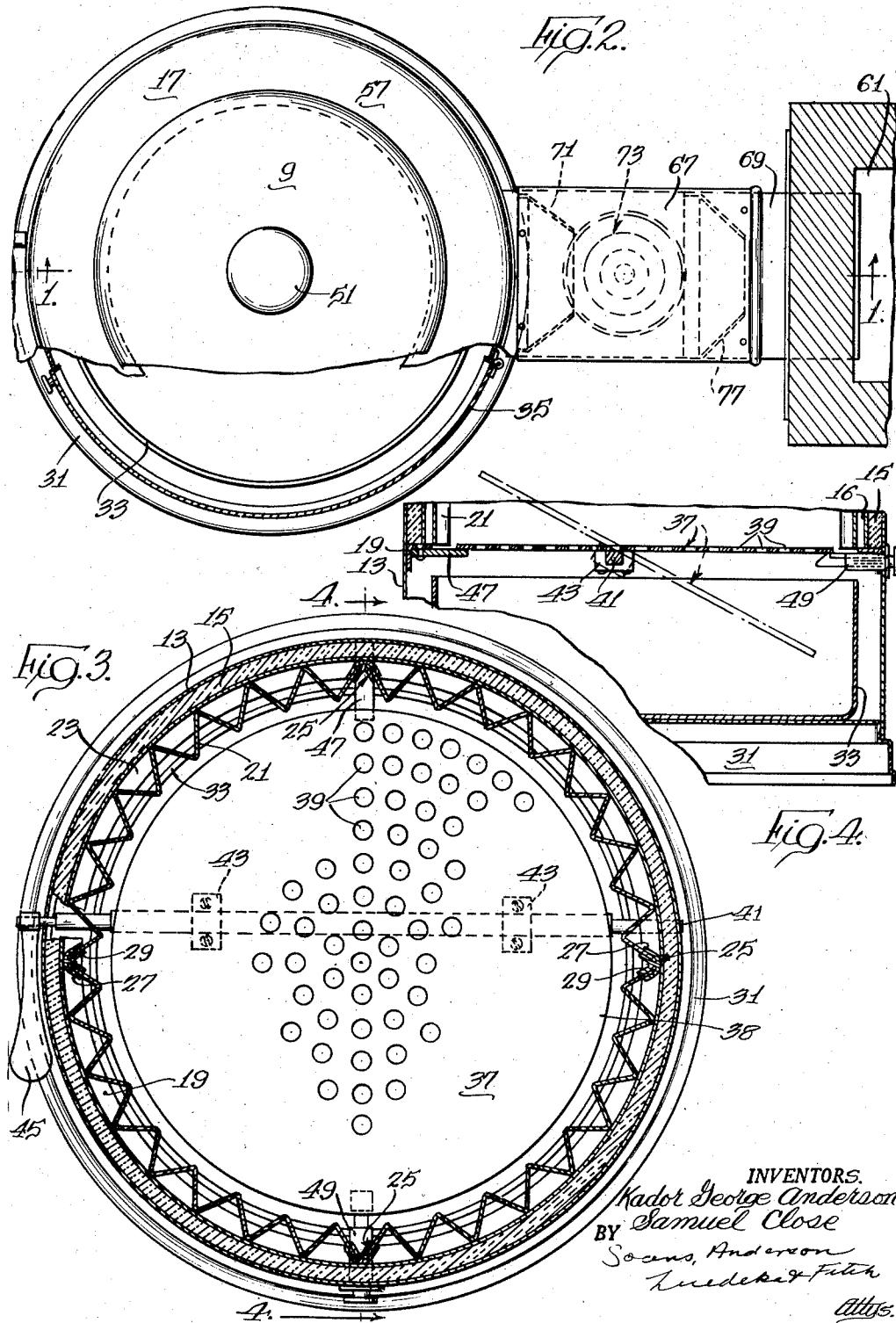
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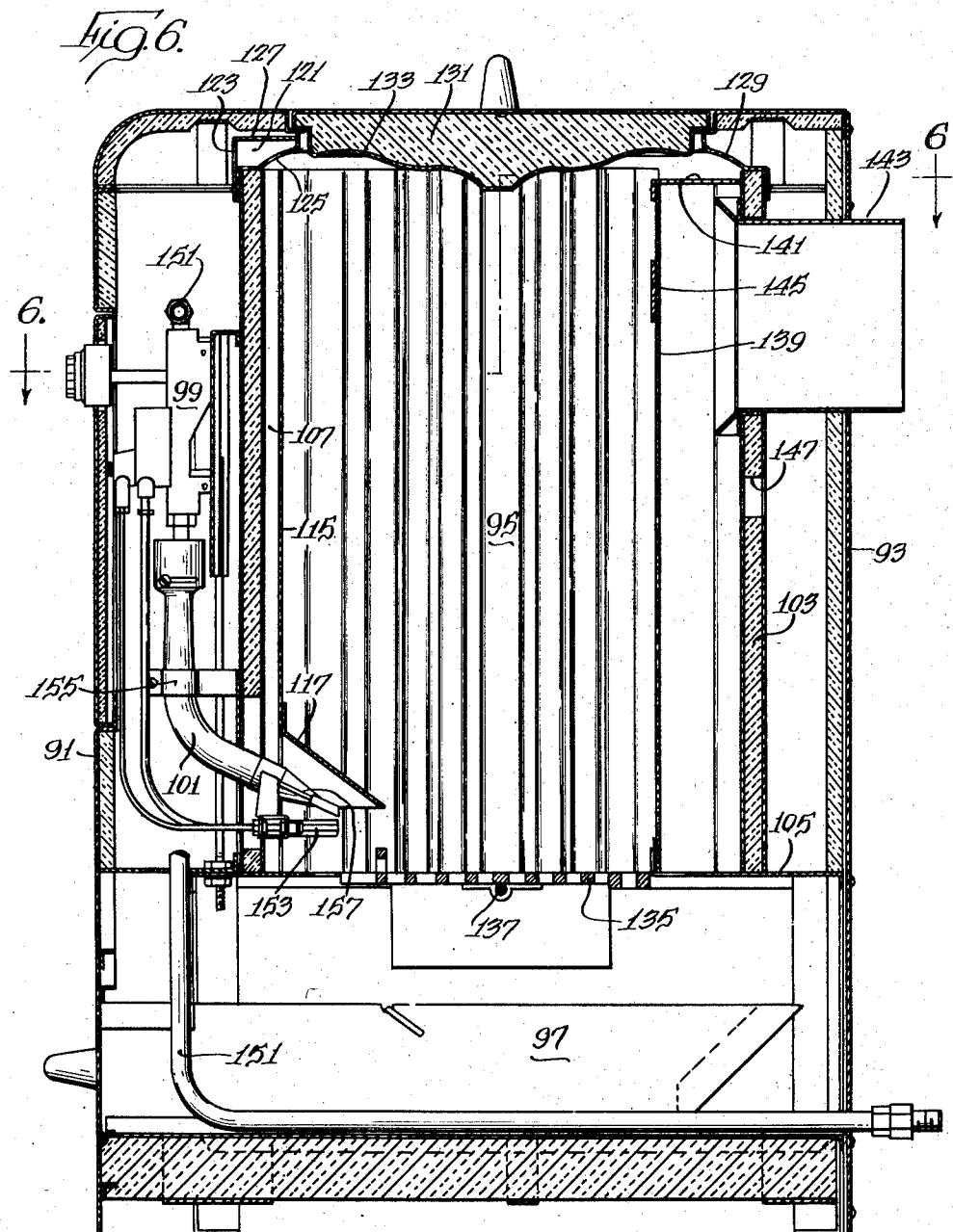
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INCINERATOR

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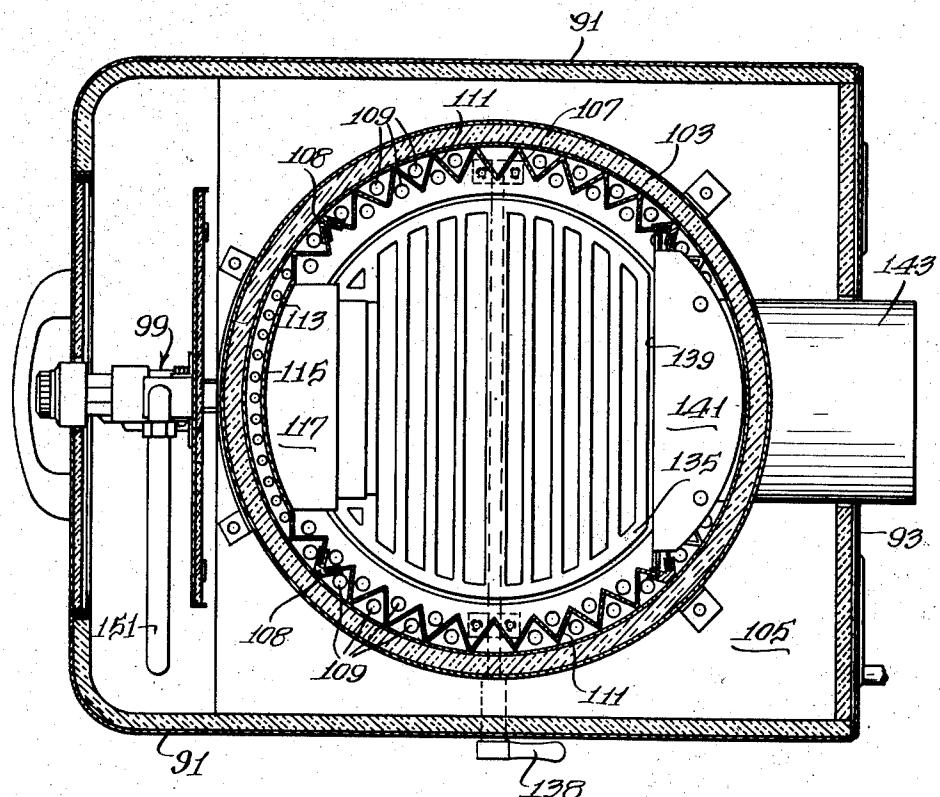
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INCINERATOR

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Fig. 7



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INCINERATOR

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The present invention relates generally to incinerators, and more particularly, it relates to an incinerator which effects more complete combustion of refuse in the chamber so as to minimize the amount of smoke or unburned material which exudes from the incinerator, as well as the amount of ash in the incinerator.

Many types of incinerators are known and have been previously constructed. However, it has not been heretofore possible to manufacture an economical incinerator which is capable of substantially completely burning refuse in the incinerator in such a way as to minimize smoke emitted from the incinerator and as to substantially complete combustion in the combustion chamber. As a result, the burning of refuse in incinerators has substantially contributed to the contamination of air and the formation of "smog" over entire cities. This has become a very difficult problem but this problem can be substantially aided by the provision of incinerators which burn refuse without emission of unburned materials, specifically smoke.

It will be understood that the burning of refuse is a very difficult problem because of the fact that it is frequently damp, or even wet, so that burning, almost inherently, results in the formation of substantial amounts of smoke. As before indicated, combustion of this refuse in presently known incinerators with efficient combustion and without smoke emission has not been solved in such a way as to permit construction of a simple and economical incinerator, particularly for home use.

In view of the foregoing, a main object of this invention is the provision of an improved incinerator. A further object of the invention is the provision of an incinerator which is simple in construction and can be economically built, the incinerator being operable to burn refuse without emission of smoke. A further object of the invention is provision of a simple arrangement for assembling and taking apart the incinerator.

Still further objects and advantages of the invention will become apparent by reference to the following description and accompanying drawings, in which:

Figure 1 is a cross-sectional view, in side elevation of an incinerator of the invention, the view being taken along line 1—1 in Figure 2;

Figure 2 is a plan view of the incinerator shown in Figure 1, the view being partially in cross-section;

Figure 3 is a cross-sectional view being taken along line 3—3 in Figure 1;

Figure 4 is a fragmentary, cross-sectional view particularly showing the grate of the incinerator;

Figure 5 is an enlarged cross-sectional view illustrating the manner of connecting the liner elements of the incinerator;

Figure 6 is a cross-sectional view, in side elevation, of another incinerator of the invention, the view being taken along line 6—6 in Figure 7; and

Figure 7 is a plan view of the incinerator shown in Figure 6, the view being partially in cross-section.

An incinerator of the present invention, as shown in

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Figures 1 to 5, inclusive, comprises a body section generally designated by the numeral 7, a lid 9 which is of a particular construction so as to assure more complete burning of the combustion chamber of the body section and an exhaust gas burning section 11 for burning any combustible matter which is not consumed in the combustion chamber.

The body section 7 is, in the illustrated unit, built up from sheet metal pieces and comprises an outer wall 13 which is formed into a generally cylindrical section. Inwardly of the wall is provided one or more layers of insulating material 15 which, of course, prevent the outer wall from becoming too hot. An inner wall 16 may be employed to hold the insulating material in place, though, as will be seen hereinafter, this wall is not necessary.

Attached to the upper edge of the outer wall is an annular lid receiving section 17 which is shaped to accommodate the lid 9 on the body section 7 and is also shaped, on its underside, to direct gases to the lid in a particular way, to be hereinafter described. In general, however, the underside of the annular section 17 is formed to direct the gases to the underside of the lid 9 in such a way that these gases can be directed into the central portion of the body section 7.

Intermediate the ends of the outer wall 13 but adjacent the lower end of the wall is provided a circumferentially extending angle member 19 which may be welded or bolted to the wall 13 of the body section 7. The angle member 19 supports a plurality of liner elements 21 which extend vertically in the incinerator. As shown in Figure 3, these elements cover the inner surface of the inner wall 16 and are, therefore, generally arcuate in their horizontal extent. However, the liner elements are corrugated (Figures 3 and 5) to provide air passageways 23 for purposes to be hereinafter described.

The liner elements 21 along their vertical edges engage a holding means 25. This holding means as illustrated, comprises a pair of angle sections 27 and 29 which are held in spaced relation at their apices by a section 31. The angle sections 27 and 29, and the section 31 define slots 33 and 35 for receiving the edges of adjacent liner elements 21 (Figure 5). The holding means 25 may not be attached to the inner wall 16 so that the liner elements can freely expand and contract. Of course, the holding means may be welded to the inner wall 16 with expansion and contraction being permitted in the slots 33 and 35. However, because attachment of the holding means 25 to the body section is not required, the holding means may be integral with the liner elements.

It will be apparent that the liner of the incinerator may comprise a substantial number or a few liner elements 21. I have found, however, that good results are achieved with the use of four liner elements 21.

As pointed out, the holding means 25 may be so designed as to permit expansion of the liner elements 21, without difficulty, and, at the same time, permits air from the passageway 23 to enter the combustion chamber along the vertical extent of the chamber. Furthermore, the holding means 25 is simple in construction and economical to manufacture. While other holding means may be provided, the particular holding means shown provides unusual features.

The body section 7 further includes a base 31, which is circular in the illustrated arrangement. Mounted on the base 31 is the outer wall 13. The base also provides a platform for the usual ash pan 33 and a suitable door 35 is provided for removing and replacing the ash pan, the door covering an opening in the outer wall 13.

Above the ash pan 33 is located a grate 37, which, because of the unusual features of this invention, may be made of sheet metal. The grate, as illustrated, is a

circular plate 38 in which are stamped a plurality of openings 39, the plate being located within the liner elements 21 (Figure 3).

The circular plate 38 is carried on a rod 41 which is fixedly secured to the plate by brackets 43 and which is journaled in the circumferentially extending angle member 19 and outer wall 13. To facilitate dumping of the grate 37, the rod 41 is eccentrically located, i. e. off-center, and for purposes of dumping the grate 38, a handle 45 is attached to the rod 41.

In order to hold the grate 38 level while the incinerator is being loaded, a stop 47 is located at an edge of the grate 38 and is attached to the outer wall 13. A releasable stop 49 engages an opposite edge of the grate 38 and is also attached to the outer wall 13 of the incinerator. The stops 47 and 49 are diametrically opposed and are each located at positions about 90 degrees from the axis of the rod 41.

In the illustrated embodiment of the invention, the grate 37 extends in close proximity of the liner elements 21 and since these elements overhang the angle member 19, a space is provided. However, the angle member may be extended to close this space, if desired, provided that suitable air openings are provided for admitting air to the passageway 23.

The construction of the lid 9 is an important feature of this invention. The lid 9 may be formed from a sheet metal section and the usual handle 51 provided. Likewise the lid may be provided with insulation 53 to keep the outer side cool. However, an important feature of the lid is the contour of the inner side. In general, the contour is that of an inverted cone so that the central portion of the lid extends into the combustion chamber, as shown in Figure 1. It is important that the edges of the lid communicate with the upper ends of the passageways 23 so as to direct air from the passageways into the central portion of the combustion chamber.

While in the illustrated embodiment the lid comprises an inner section 55 of sheet metal and a cover section 57 of like material, it will be apparent that the insulation 53 may be a ceramic material so that the inner and cover sections 55 and 57 may be eliminated.

The exhaust gas burning section 11 communicates between the incinerator and a chimney 61. This section communicates with the combustion chamber of the incinerator through an opening 63 formed in the upper end of the incinerator. A flange 65 is attached to the outer wall of the incinerator and connects to a pipe 67 which is included in the exhaust burning section 11. The pipe 67 connects to a flue pipe 69 in the chimney 61.

In the pipe 67, adjacent the incinerator, there is provided a diverting baffle 71 for diverting the exhaust gases into a burner 73 located at the bottom of the pipe 67. The burner 73 is mounted in a cup 75 which is bolted to the underside of the pipe 67. In order to prevent drafts from the chimney from extinguishing the burner 73, a guard baffle 77 is bolted to pipe 67 outwardly of the burner 77. Each baffle 71 and 77 extends around approximately one-half the circumference of the pipe and extends into the pipe a distance about equal to the radius of the pipe 67.

It is important that the pipe 67 communicate with the air passageway 23 about its lower periphery. This assures adequate air for the burner 73 and prevents its extinguishment by smoke.

The burner 73 may be of conventional construction and is connected by suitable piping 81 to a source of gas. As shown in the drawings, the burner includes a pilot burner 83 and a main burner section 85.

A second burner 87 may be provided in the body section 7 for burning the refuse in the incinerator. This burner, of course, is connected to a suitable source of gas and is preferably surrounded by a guard 89 to prevent refuse from smothering the flame.

In the operation of the incinerator of the invention, the incinerator is filled with refuse through the top. The

lid 9 is applied to the body section 7 and the burners 73 and 87 are ignited. As heat is developed air is drawn from the bottom of the body section through the air passageway 23 to the top of the body section 7. This air mixes with the smoke and the smoke and air are directed by the lid 9 back into the central portion of the body section 7. This enrichment of smoke with air and direction of the enriched smoke into the body section assures maximum combustion and is one of the more important features of the invention.

The gases which leave the incinerator enter pipe 67 but are first directed into the burner 73 by the baffle 71. This effects burning of any of the remaining combustible material so that the gas entering the chimney 61 is completely burned. The exit gas entering the pipe 67 is also enriched with air from the passage 23, the enriching air entering at the inner bottom edge of the pipe 67.

It will be seen that the air in the passageway 23 is warmed as it rises so as to be in most satisfactory condition for aiding combustion. Furthermore, it will be recalled that some of the gas enters the body section through the slots 33 and 35 between the liner elements 21 to further aid burning.

The described incinerator has burned typical refuse without producing smoke where other conventional incinerators have failed. The incinerator of the invention may be very economically built and is of unusually light weight construction.

Figures 6 and 7 of the drawings illustrate a commercial embodiment of the invention, which embodiment is being marketed. As shown in Figures 6 and 7, the incinerator comprises an outer shell 91 which is fabricated from enameled metal so as to provide a decorative unit. The visible portion of the shell 91 is white enamel, in the production model, and the back plate 93 of the shell is of a black enamel. Contained within the shell 91 and back plate 93 is a burning section 95, ash collecting section 97, control section 99 and a burner 101.

The burning section 95 is enclosed within an insulated jacket 103 which is carried on a base plate 105. Disposed within the insulated jacket 103 is a corrugated liner 107 which is built up from sections which are united at joints 108. These joints 108 comprise angle sections which are substantially the same as the holding means 25 shown in Figure 5 and previously described.

The base plate 105 is provided with openings 109 for feeding air from the ash collecting section 97 into the burning chamber 95. These openings 109 are so disposed as to provide air in front of and in back of the corrugated liner 107.

The corrugated liner comprises arc-shaped sections 111, and section 113 which includes a non-corrugated, cylindrical section 115 disposed at the front of the burning section which carries a protective plate 117 at its bottom end. The protective plate 117 extends downwardly and rearwardly and covers the burner 101 so as to prevent the material in burning section 95 from extinguishing the burner. The protective plate 117 is located a sufficient distance above the burner to prevent undue heating of the plate 117.

In order to provide additional air at the top of the burning section 95 and to increase burning efficiency at the top of the burner, a channel 121 is provided with openings 123 and 125 for conducting air into the top of the burning section 95. This channel is formed from an angle section 127, as shown in Figure 6, which fits over a collar 129 disposed at the top of the burning section 95. The angle section, in the commercial embodiment, only extends around a portion of the collar section 129 at the front of the incinerator.

A lid 131 is disposed at the top of the burning section 95 and is formed with a series of convolutions 133 on its bottom side for directing the flame and air into the burning chamber 95. The top 131 may be made from ceramic material or lined with suitable insulating material.

Located at the bottom of the burning section 95 is a grate 135 which is pivotally supported on a pin 137. The grate may be actuated by a handle 138 which is accessible outside the shell 91 of the incinerator. The grate is proportioned to clear the protective covering 117 when the grate is tipped.

At the back of the burning chamber 95 is disposed a screen 139 which extends across the back side of the incinerator. The screen, of course, could comprise a perforated section, and defines an open section at the back of the burning chamber 95 between the screen and corrugated liner 107. At the top of the screen is disposed a protective plate 141 which prevents refuse from entering the section back of the screen.

The screen 139 is disposed in front of the chimney opening 143 and, therefore, the protective plate 141 covers the chimney opening. In order to prevent channelling of the flame in the burning section directly out of the chimney and smoke exudation, a blocking plate 145 is disposed on the screen 139 in front of the chimney.

In order to provide adequate air into the section in back of the screen 139, openings are provided in the bottom plate 105. In addition, an opening 147 is provided in the insulated jacket 103 for feeding air into the section to the rear of the screen 139.

The use of the screen not only provides a substantial amount of oxygen for burning of any smoke but, in addition, provides more air to the material in the burning chamber 95. This aids in assuring adequate burning of the smoke so that substantially smoke-free gases are discharged through the chimney section 143.

The control section 99 for the burner is of conventional construction and arrangement. The control section provides gas, which is received through pipe 151, to the burner 101 and the section protects against flame-out of the burner by means of the thermocouple 153.

The burner 101 is carried in a bracket 155 which is mounted on the insulated jacket 103. The burner 101 includes a nozzle 157 which is formed to spread the flame across the bottom of the burning chamber so as to assure burning of all points of the burning chamber. While various arrangements can be provided, it is desirable to spread the flame in the manner indicated.

A principal feature of this invention is effecting substantially complete burning of refuse primarily by re-burning a substantial portion of the smoke in the burning chamber 95. In this connection, the conical top provides substantial benefit and, such reburning can be effected in the burning section 11 shown in Figures 1 and 2 of the drawings. Alternatively, the gases may be drawn from below the grate in the incinerator shown in Figures 6 and 7 of the drawings so that the burner 101 provides not only ignition of the refuse but, in addition, it provides further burning of the smoke. In this instance, the chimney section 143 could be placed below the base plate 105 and the gases drawn from the incinerator through such chimney section. In such event, air would be provided around the insulated shell 103.

The present invention makes possible substantially complete burning of the refuse in incinerators without smoke which has caused such a difficult problem in many metropolitan areas. The invention is in commercial manufacture and is providing a desired need in the incinerator field.

The various features of the invention which are believed to be new are set forth in the following claims.

We claim:

1. An incinerator comprising, in combination, a vertically extending body section having an outer wall and a liner, said liner comprising a corrugated section, said outer wall and said liner defining a passageway therebetween, said passageway communicating with the top of said body section whereby air from the bottom of said body section is introduced into the top of said body section, said liner extending upwardly from a plate section having openings therein for feeding air into the corrugations on opposite sides of said liner, a lid on said body section having an inner side formed in the shape of an inverted cone to direct smoke and air from said passageway into the central portion of said body section, and air guide means for directing air from said passageway toward the underside of said lid.

2. An incinerator comprising, in combination, a vertically extending body section having an outer wall and a generally cylindrical liner, said liner comprising corrugated sections, said outer wall and said liner defining a passageway therebetween, said passageway communicating with the top of said body section whereby air from the bottom of said body section is introduced into the top of said body section, said liner extending upwardly from a plate section having openings therein for feeding air into the corrugations on opposite sides of said liner, vertical extending holding means for receiving the vertical edges of said corrugated sections, said holding means including a slot for slidably receiving the vertical edges of said corrugated sections, a lid on said body section having an inner side formed in the shape of an inverted cone to direct smoke and air from said passageway into the central portion of said body section, and air guide means for directing air from said passageway toward the underside of said lid.

3. An incinerator comprising, in combination, a vertically extending body section having an outer wall and a generally cylindrical liner, said liner comprising corrugated sections, said outer wall and said liner defining a passageway therebetween, said passageway communicating with the top of said body section whereby air from the bottom of said body section is introduced into the top of said body section, said liner extending upwardly from a plate section having openings therein for feeding air into the corrugations on opposite sides of said liner, vertical extending holding means for receiving the vertical edges of said corrugated sections, said holding means including a slot for slidably receiving the vertical edges of said corrugated sections, said holding means having a depth sufficient to accommodate expansion of said corrugated sections when said sections are heated, said holding means also receiving said sections when said sections are unheated, a lid on said body section having an inner side formed in the shape of an inverted cone to direct smoke and air from said passageway into the central portion of said body section, and air guide means for directing air from said passageway toward the underside of said lid.

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