

Sept. 22, 1959

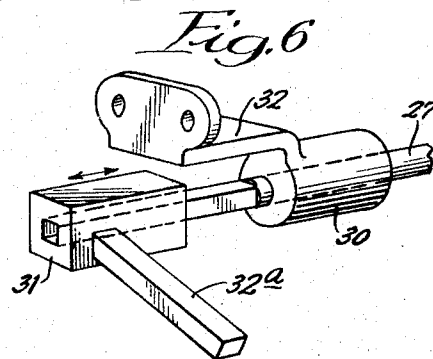
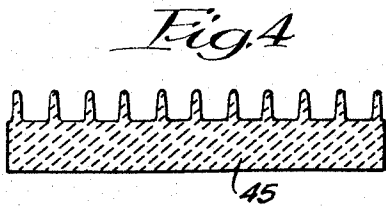
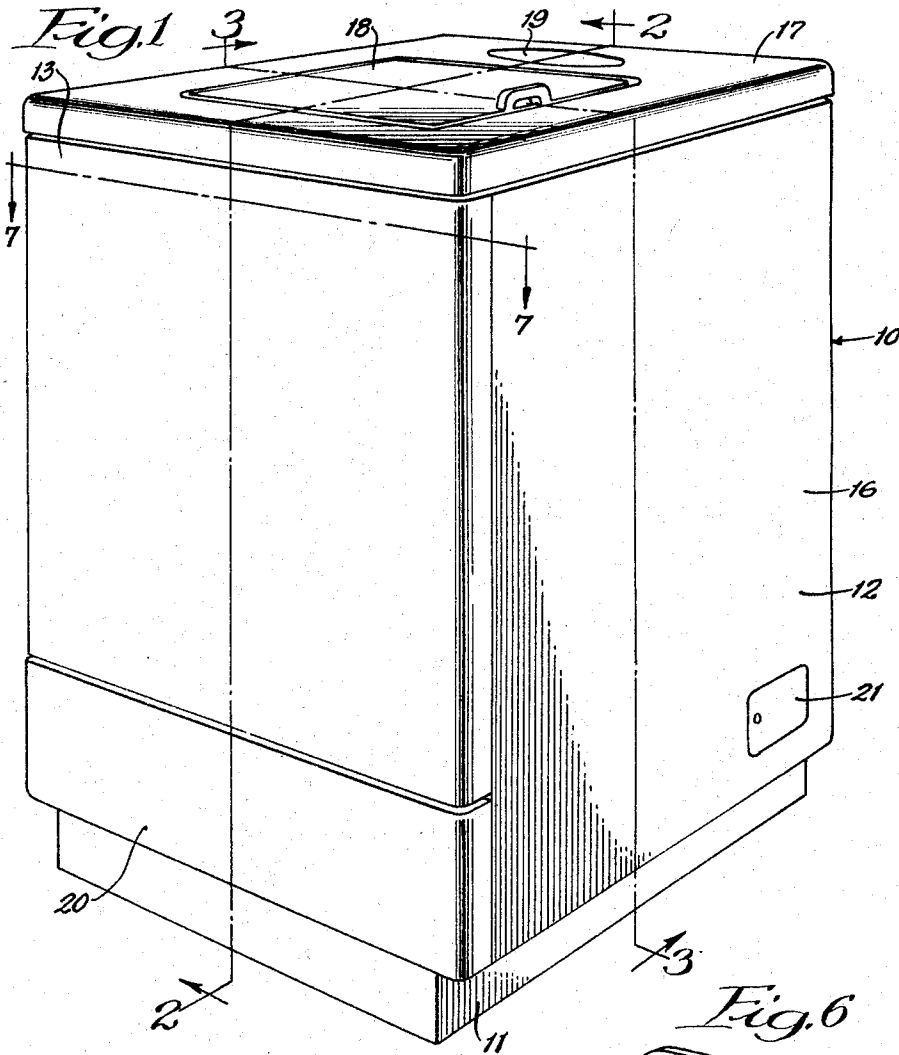
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2,905,115

INCINERATOR

Filed Aug. 30, 1955

4 Sheets-Sheet 1



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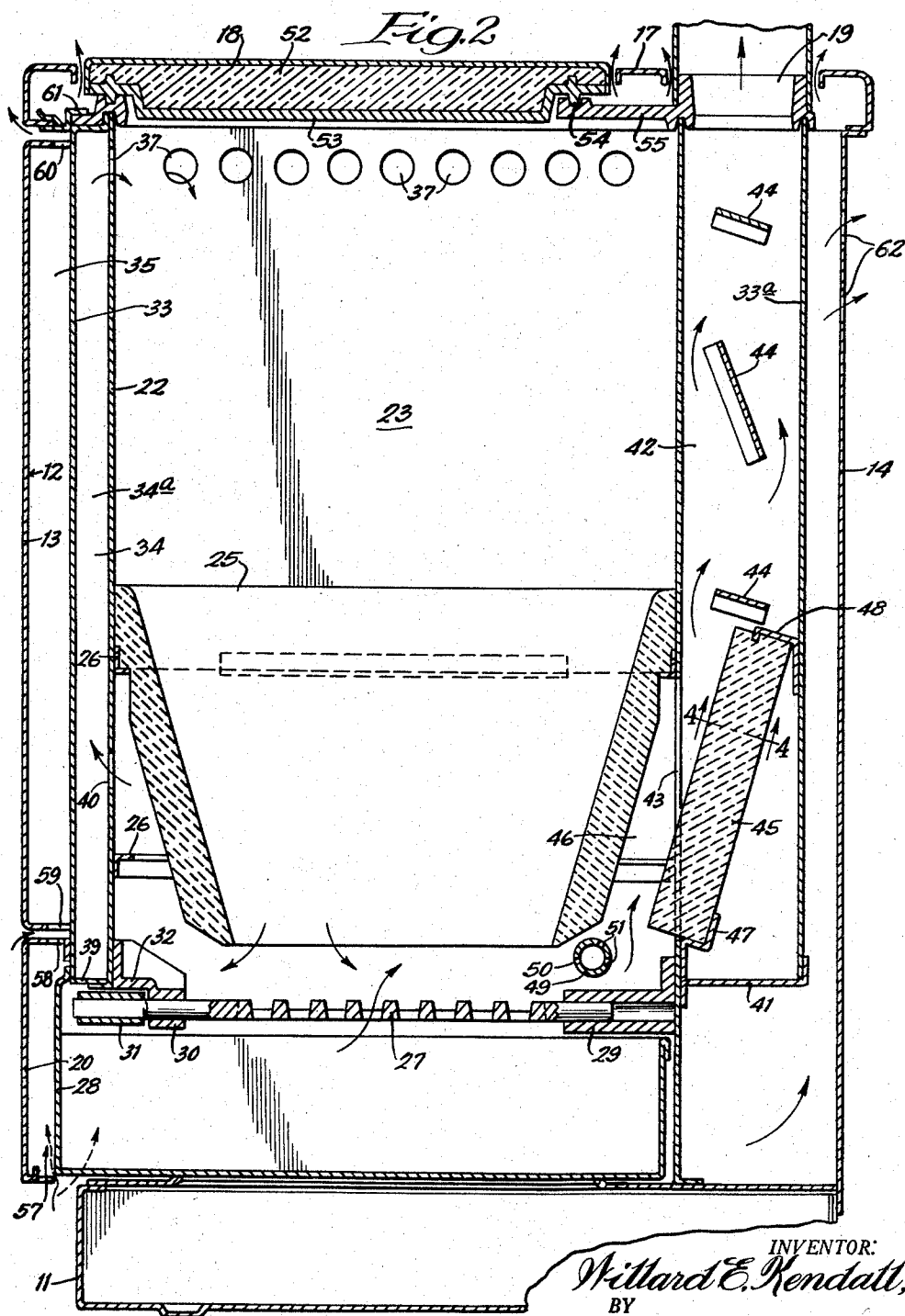
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INCINERATOR

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4 Sheets-Sheet 2



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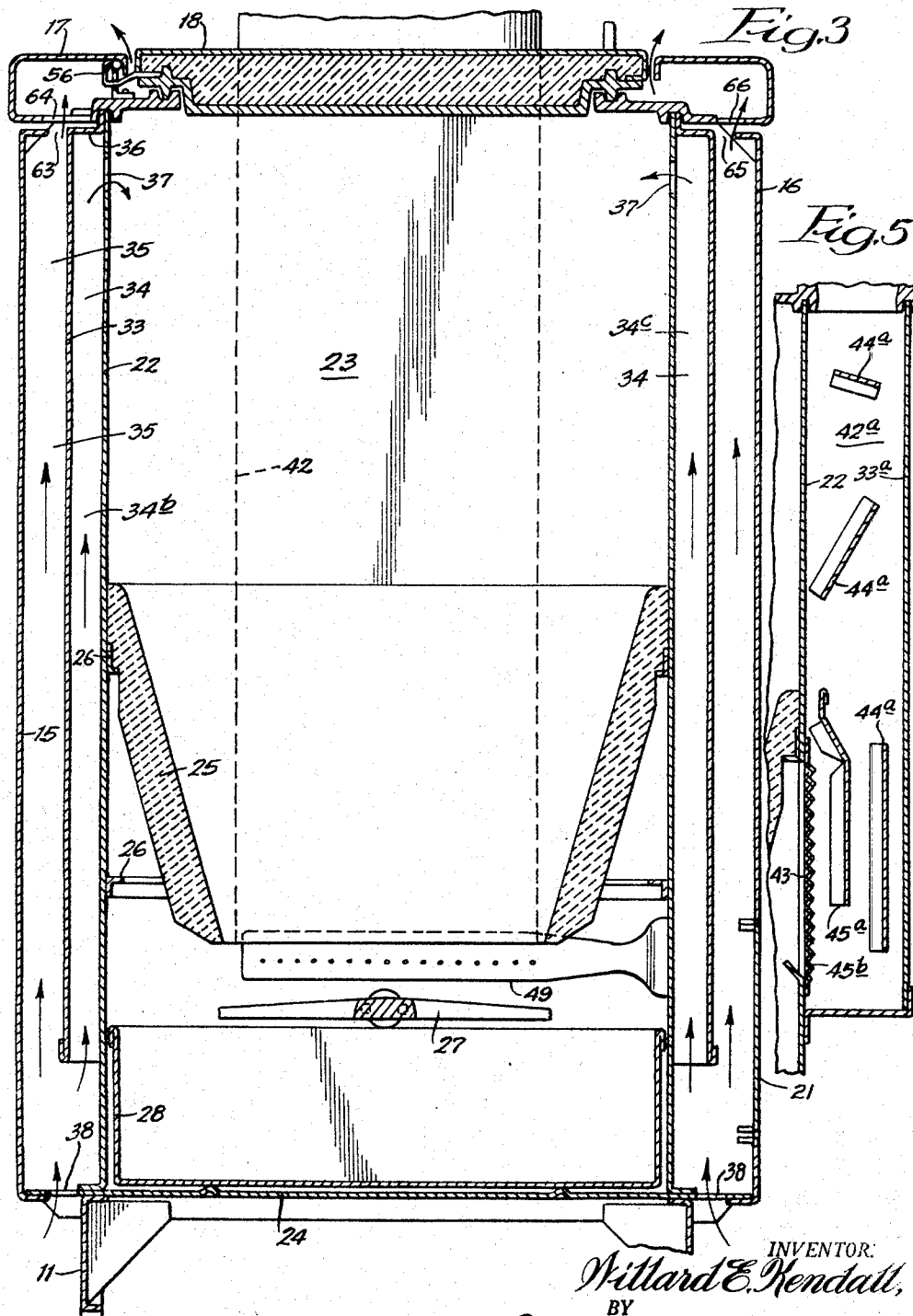
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INCINERATOR

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4 Sheets-Sheet 3



Sept. 22, 1959

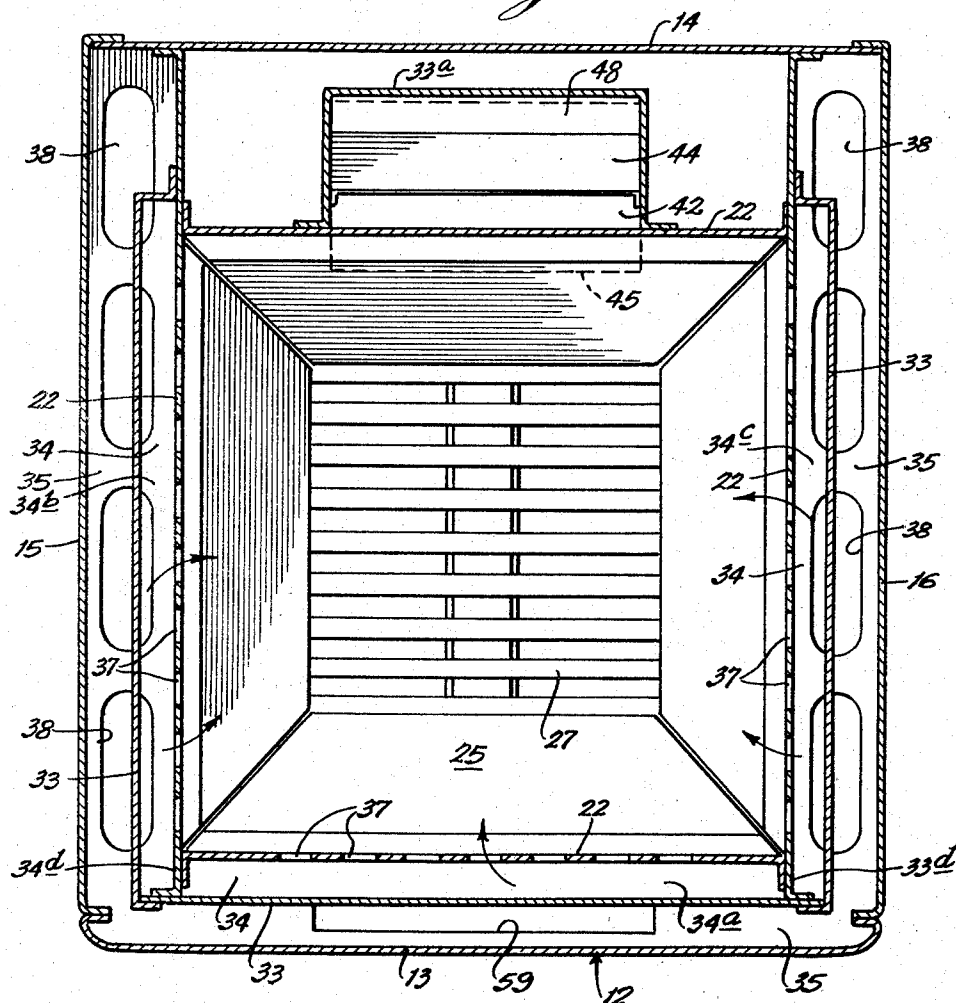
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4 Sheets-Sheet 4

Fig. 7



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2,905,115

INCINERATOR

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6 Claims. (Cl. 110—8)

This invention relates to a device for burning combustible materials such as rubbish etc., and is more particularly concerned with an incinerator especially suited for home use.

One of the primary problems in incinerators is that of minimizing smoke, and a considerable amount of effort has been directed toward the elimination of smoke in home incinerators, and of the problem of odors which is coincident with the production of smoke. Another problem that has presented itself is that of providing an incinerator having a long life and one that requires only a minimum of maintenance and repair. Insofar as is known, no commercially available incinerator provides a satisfactory solution to either of these problems.

It is, accordingly, an object of this invention to provide an incinerator having a long life, and one that will operate for long periods of time without the necessity of maintenance and repair. To this end, another object of the invention is in providing an incinerator in which the burner is removed from the fire pot or combustion chamber and is protected from the direct flames of burning materials therein.

Another object of the invention is in the provision of an incinerator wherein smoke is substantially eliminated from the combustion gases. Still another object is that of providing an incinerator wherein primary air for combustion is drawn downwardly through the combustion chamber and burning materials therein, and in which the combustion gases are drawn out of the combustion chamber from the bottom thereof. Yet another object of the invention is to provide an incinerator having a primary burner for igniting materials in the combustion chamber and a secondary or after burner for burning smoke products from the combustion gases.

A further object of the invention is in providing an incinerator in which portions of the combustion gases are recirculated, and along with the primary air are drawn downwardly through the combustion chamber. Yet a further object is to provide an incinerator having an inner casing defining a combustion chamber communicating at its lower end with a flue, an air shield enclosing the inner casing to provide a flow passage therebetween, the inner casing having openings at its upper end communicating with the passage so that primary air for combustion is drawn from the passage and into the combustion chamber through the openings at the upper end thereof. In this construction, the combustion chamber at its lower end communicates with at least a portion of the passage defined by the air shield so that a fraction of the gases of combustion are drawn upwardly through the passage and are recirculated through the combustion chamber, while the remaining fraction of the combustion gases are passed over the burner interposed in the flow path thereof between the combustion chamber and the flue of the device. Additional objects and advantages will become apparent as the specification proceeds.

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Illustrative embodiments of the invention are shown in the accompanying drawings, in which—

Figure 1 is a perspective view of an incinerator embodying the invention; Figure 2 is a vertical sectional view taken along the line 2—2 of Figure 1; Figure 3 is a vertical sectional view taken along the line 3—3 of Figure 1; Figure 4 is an enlarged detailed sectional view taken along the line 4—4 of Figure 2; Figure 5 is a broken vertical sectional view showing a modified form of flue; Figure 6 is a broken perspective view of the grate handle; and Figure 7 is a plan sectional view of the incinerator along the line 7—7 of Fig. 1.

Referring to Figure 1, it is seen that the incinerator 10 has a base or pedestal 11 and an outer casing 12 that is generally rectangular to provide front and rear panels 13 and 14, respectively, and side panels 15 and 16. The casing is equipped with a top 17 having a handle-equipped closure door 18 and an opening 19 adapted to be connected to a chimney or other flue outlet. The front panel 13 is interrupted and at its lower end is provided with a closure door 20. The side panel 16 is provided with an access door 21 that provides entry into the interior of the incinerator for lighting the pilot light.

Mounted within the outer casing 12 is an inner casing 22 that defines a combustion chamber 23 therein. As is shown best in Figure 3, the inner casing 22 may be welded or otherwise rigidly secured to the bottom wall 24 of the structure which is carried by the pedestal 11. Positioned below the center of the chamber 23 is a fire pot 25 that is defined by a frusto-pyramidal fire brick material supported on the walls of the inner casing 22 by hangers 26. The fire pot 25 converges inwardly and downwardly to define a somewhat restricted opening at its bottom. In the specific illustration, the fire pot is sectional and of four-piece construction.

As is shown most clearly in Figure 2, and also seen in Figure 3, a grate 27 is positioned below the fire pot 25 and above the ash tray or receptacle 28 that is secured to the front panel portion 20 and is slidable into and out of the incinerator.

The grate 27 is supported at its rear end for rotary movement in a support member or bearing 29 rigidly secured to the inner casing 22. Adjacent its forward end, the grate 27 is supported for rotary movement in a bearing 30 that is also rigidly carried by the inner casing 22. A portion of the grate extends outwardly through the bearing 30 and slidably receives thereon a lock member 31 which is polygonal in cross section and preferably rectangular. When the lock member is in the position shown in Figure 2, any tendency toward rotation of the grate 27 is prevented by abutment of the slidable lock 31 with the flat hanger portion 32 of the bearing 30. However, when the lock member 31 is moved outwardly (or to the left as viewed in Figure 2), which can be done when the tray 28 is withdrawn slightly from the closed position shown in Figure 2, the lock member will clear the portion 32 and permit the grate to be rotated, by means of the handle 32a, to dump any ash or unconsumed combustion products received thereon into the tray 28. As has been brought out before, the tray may be removed to empty it.

Interposed between the inner casing 22 and outer casing or panels 12 is an air shield 33 which provides passages 34 and 35 in cooperation with casings 22 and 12, respectively, as best seen in Fig. 7. The air shield 33 is spaced from the inner front wall of the casing to define an air passage 34a therebetween, and is also spaced from the adjacent outer casing wall to define a portion of air passage 35 therewith. The air shield 33 along the side panels 15 and 16 is open at the lower

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end thereof to permit air to flow upwardly through the passages 34b and 34c, as is shown in Figure 3, that are defined between those panels and the shield. At the upper end thereof, the shield is equipped with an inwardly turned flange 36 that is joined to the inner casing 22. The inner casing 22 is provided with a plurality of openings or ports 37 communicating with the passages 34a, 34b and 34c (which are isolated from each other at the corners of the casing as at 34d in Fig. 7) to permit air that circulates upwardly therethrough to be drawn into the combustion chamber 23.

The outer casing panels 15 and 16 are turned inwardly at the lower ends thereof and are secured to the bottom wall 24 of the structure. However, a plurality of flow ports 38 are provided in the bottom wall to permit air to flow upwardly and through the passages 34 between the inner casing 22 and shield 33 in the areas thereof adjacent the side panels 15 and 16, all as is shown in Figure 3.

The shield 33 has an inwardly turned flange 39 at its lower end along the side thereof adjacent the front panel 13, and that flange is secured to the inner casing 22. The adjacent inner casing wall is provided with flow ports 40 therein communicating with the flow passage 34a in that area. Extending along the rear panel 14 is a shield portion or flue back 33a secured to the inner casing 22 by a bottom plate 41. The passage defined between the flue back 33a and inner casing 22 at the rear of the incinerator forms a flue 42 communicating through a flue opening 43 with the interior of the casing 22. The flue 42 has an outlet 19 at its upper end.

The flue 42 is equipped with a plurality of baffles 44 that are effective to retard the flow of flue gases upwardly therethrough. Preferably, a refractory fire wall 45 inclines upwardly and rearwardly through the port 43 and defines, with a portion of the fire pot 25, a flow passage 46 for the flow of combustion gases into the flue. Brackets 47 and 48 carried respectively by the inner casing 22 and flue back 33a provide a mounting for the fire wall 45.

Positioned at the mouth of the passage 46 is a burner 49 that, as is seen from Figure 2, is protected from the flames of material burning within the fire pot 25 by a portion of the fire pot. The burner 49 in effect forms a primary burner and an after burner, for it has ports 50 which are directed forwardly toward the interior of the fire pot 25 and ports 51 which are oriented rearwardly toward the passage 46 that carries combustion gases from the combustion chamber to the flue.

Preferably, the cover 18 that provides access to the interior of the combustion chamber 23 is insulated, as is shown at 52, and has an inner panel 53 equipped with a perimetric, depending flange 54 that seats within a complementary recess provided by a closure wall 55 extending about the upper end of the inner casing 22. The cover 18, as is seen in Figure 3, is equipped with a hinge 56 that permits the same to be swung between open and closed positions.

Referring back to Figure 2, it will be seen that a plurality of flow ports 57, 58, 59 and 60 along the front of the incinerator permit air to flow from bottom to top thereof between the front panel 13 and air shield 33. Between the rear panel 14 and the shield or rear wall 33a of the flue 42, air may circulate upwardly and outwardly through the ports 62 provided in the rear panel 14.

Figure 3 shows most clearly that air may flow upwardly between the side panel 15 and shield, through the apertures or openings 38, openings 63 and 64 and outwardly about the hinge 56. In a similar manner, air may flow between the shield and the panel 16 through the openings 38 and 65 and 66, and outwardly between the surfaces of the top 17 and closure door.

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In effect, four individual passages are defined between the shield 33 and inner casing 22. For purposes of identification, the passages adjacent the side panels 15 and 16 are designated with the numerals 34b and 34c, the passage along the front panel 13 is designated with the numeral 34a, while the passage along the rear wall 14 (as has been brought out before) defines the flue and has been designated with the numeral 42.

A modified form of flue is illustrated in Figure 5, and is designated with the numeral 42a. It is defined between the shield 33a and inner casing 22 and is equipped with a plurality of baffles 44a. The primary difference between this flue and the one heretofore described is the elimination of the fire wall, which is formed of a fire brick material, and the replacement therewith of a depending baffle 45a and a fly ash screen 45b of expanded metal covering the opening 43.

Operation

In use of the incinerator, the lid 18 is swung open on its hinge to provide access to the interior of the chamber 23. The material to be burned is inserted into the chamber through the access opening thereof. Thereafter, the lid is closed and a cycle of operation commenced.

Combustion gases ultimately travel from the interior of the chamber 23 through the flue 42 and outwardly therefrom to atmosphere. The solid particles remaining after combustion are carried downwardly and onto the grate 27 with a portion thereof filtering through the grate and into the interior of the tray 28. Any particles collecting along the top of the grate can be dumped therefrom by withdrawing the tray slightly to permit the sleeve or latch 31 to be slid longitudinally along the stem of the grate so as to clear the stop member 32. Such movement of the latch 31 permits the grate to be rolled over to spill collections thereon into the tray. The tray can be withdrawn completely from the incinerator for dumping the contents thereof.

With a body of material to be burned within the fire pot 25, the burner is ignited and the flames extending outwardly from the apertures 50 ignite the material and effectuate the burning thereof. Primary air for combustion flows upwardly through the passages 34c and 34b (shown in Figure 3), through the openings 37 in the inner casing and downwardly through the combustion chamber to the site of the burning material. That is to say, the air circulates in a pattern reverse to the normal flow pattern of air through burning material.

The combustion gases in their flow path pass over the burner 49 on their way to the flue 42 through the passage 46. When the burner is ignited, flames extend upwardly from the apertures 51 and into the passage 46. Thus, the single burner provides not only the primary flame but also functions as an after burner, and in heating the combustion gases and the walls of the passage 46 cause the smoke particles within the combustion gases to be burned, whereby substantially smokeless and odorless gases are expelled through the flue 42. The baffles 44 are arranged to retard the flow of gases through the flue and to thereby retard the gases for a sufficient time so that the smoke particles therein can be consumed.

As is shown most clearly in Figure 2, the combustion chamber 23 at its lower end communicates with the passage 34a, which in turn opens at its upper end into the combustion chamber through the openings 37 in the inner casing. A portion of the combustion gases flows from the lower end of the combustion chamber, upwardly through the passage 34a and into the upper end of the combustion chamber. These combustion gases, along with the primary air drawn through the passages 34c and 34b, are drawn downwardly through the combustion chamber and through material burning in the fire pot section 25 thereof. It has been found that with the apertures 40 closed, which provide the communication

between the passage 34a and lower end of the combustion chamber, that the combustion gases contain a considerable amount of smoke. Thus, the recirculation of a portion of the combustion gases contributes to the end product of a substantially smokeless incinerator.

Secondary air for combustion is provided by leakage about the ash tray 28 and about the panel 20. It will be noted that the only section of the incinerator that is insulated is the door 18, and except for the door the outer casing of the incinerator is maintained in a relatively cool condition by the flow of air circulating upwardly through the passage 35 or upwardly between the air shield and the outer casing. It is seen that this air, or a portion thereof, carries upwardly and into the closures in the top wall 17 of the incinerator about the closure door 18.

It is shown most clearly in Figure 2 that the burner 49 is positioned in a protected relation beneath and spaced laterally slightly of the inner surfaces of the fire pot 25. Thus, the flame produced by material burning within the fire pot does not directly contact the burner, and this is advantageous for it has been found that where the burner is in direct contact with the flame of burning material in an incinerator that the burner quickly deteriorates and must be frequently replaced. With the instant construction, the heavy fire brick material protects the burner and only the combustion gases come in direct contact therewith. Where the refuse or material within the combustion chamber contains about 50% dry material, and after the combustion chamber has been suitably heated by the burner 49, the material will burn completely without the use of the burner due to the air flow pattern through the combustion chamber. Thus, the burner can be shut off. After the burner has been ignited for a substantial time, the walls of the passage 46 are heated up, and the heat within the passage is often sufficient to burn the smoke products from the combustion gases as those gases flow through the passage. In the particular incinerator herein being considered, and particularly because of the air flow pattern therethrough, flash combustion which generates smoke, and which frequently accompanies the addition of combustible material to the chamber through the covered opening thereof, is eliminated.

The function and operation of the flue is the same whether the form shown in detail in Figure 2 or the modified form shown in Figure 5 is employed. In either event, the baffles serve to retard the flow rate of combustion gases through the flue so that smoke particles carried by the combustion gases are burned therefrom, and a relatively cool breeching is maintained between the incinerator and chimney.

While in the foregoing specification embodiments of the invention have been illustrated and described in substantial detail for purposes of making a complete disclosure of the invention, it will be apparent to those skilled in the art that numerous changes may be made in those details without departing from the spirit and principles of the invention.

I claim:

1. In an incinerator of the character described, an outer casing providing front, rear and side panels and having a top, the top having an access opening therethrough equipped with a cover, an inner casing spaced from said outer casing and defining a combustion chamber therein, an air shield interposed between said inner and outer casings along the front and sides and spaced from each, partition means extending from the air shield and connected to said inner casing at the corners thereof to provide a plurality of isolated flow passages, panel means attached to said inner casing at the rear thereof and extending vertically between said inner and outer casings to define a flue, said inner casing having a flue opening adjacent its bottom communicating with said flue, said inner casing having a plurality of openings therethrough adjacent the upper end thereof communicating with the

space between the inner casing and air shield along the front and side panels, means providing for the flow of air upwardly through the spaces between said inner casing and air shield along said side panels whereby primary air for combustion flows downwardly through said chamber, said inner casing having apertures therethrough adjacent its lower end communicating with the space between the inner casing and air shield along said front panel, and means for closing the last-named space below said apertures whereby gaseous products of combustion can be recirculated upwardly through the space between the inner casing and air shield along said front panel and then downwardly through said chamber, a fire pot within said chamber adjacent the lower end thereof and having walls forming an open lower end communicating with said flue opening and said apertures, and a burner for igniting materials within said fire pot and being mounted on the outside thereof in protected relation from materials burning therein.

2. In an incinerator, an outer casing, an inner casing spaced from said outer casing and providing a combustion chamber having burner and fire pot means adjacent the bottom thereof, means closing the top and bottom of said chamber, wall means intermediate said inner and outer casings, said wall means being spaced from said inner casing, partition means extending from said wall means to said inner casing at the corners thereof to define a plurality of isolated flow passages, the flow passage at the rear of said casing providing a flue, said inner casing having a flue opening adjacent its bottom communicating with said flue, the remaining of said passages communicating with said chamber adjacent the top thereof, means for supplying primary air for combustion to the bottom of all but one of said remaining passages, apertures in the inner casing adjacent the said one passage communicating said one passage with the said chamber adjacent the bottom thereof, and means for closing said one passage below said apertures, said fire pot means having walls forming an open lower end communicating with said flue opening and said apertures, whereby products of combustion from said chamber can be recirculated into said one passage.

3. The structure of claim 2 in which the said fire pot means is equipped with downwardly convergent walls adjacent to and spaced from the bottom of said chamber and said burner means is positioned between said fire pot means and the bottom of said chamber.

4. In an incinerator, a rectangular casing providing a combustion chamber having burner and fire pot means therein, means closing the top and bottom of said chamber, a second casing about the front and sides of the first-mentioned casing and spaced therefrom, partition means extending between said first-mentioned casing and said second casing to provide with said casings three isolated flow passages, the rear of said first-mentioned casing being equipped with a flue, said first-mentioned casing having a flue opening adjacent its bottom communicating with said flue, openings in the said first-mentioned casing adjacent the front of said passages communicating said front passage with said chamber adjacent the top and bottom thereof to permit products of combustion to be recirculated through said chamber, means for closing said front passage below the bottom openings in said first-mentioned casing, the side passages communicating with said chamber adjacent the top thereof, the bottoms of said side passages being communicated with a source of primary air for combustion, said fire pot means having walls forming an open lower end communicating with said flue opening and said bottom openings.

5. The structure of claim 4 in which said fire pot means is equipped with downwardly convergent walls, said fire pot means being supported from the interior walls of said chamber above the said flue opening and said bottom openings, and said burner means is positioned below said fire pot means adjacent said flue opening.

6. In an incinerator, an inner casing providing a com-

bustion chamber having front, rear and side walls, means closing the top and bottom of said chamber, casing means about said inner casing and spaced therefrom, partition means extending between said casing means and said inner casing at the corners thereof to provide isolated flow passages along the said front, rear and side walls, the front and side walls being equipped with openings adjacent the top thereof, the bottom of the side flow passages communicating with a source of primary air for combustion, a downwardly convergent fire pot connected to the interior walls of said chamber defining therewith an annular space, openings in the front and rear walls of said chamber communicating the front and rear flow passages with said annular space, burner means interposed in said annular space adjacent the rear flow passage, said rear flow passage being equipped with an opening

adjacent the top thereof communicating said rear flow passage with the atmosphere, whereby products of combustion are either discharged to the atmosphere through said burner means and said rear flow passage, or are recirculated to said chamber through said front passage.

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