United States Patent [19]

DiNozzi

[11] **3,792,670**

[45] **Feb. 19, 1974**

[54] **CYCLONIC FLOW INCINERATOR**

[75] Inventor: **Robert D. DiNozzi**, Dedham, Mass.

[73] Assignee: **Raytheon Company**, Lexington, Mass.

[22] Filed: **July 3, 1972**

[21] Appl. No.: **268,413**

[52] **U.S. Cl.** ..... **110/8 R**, 110/18, 110/8 C,

[51] **Int. Cl.** **F23g 5/12**

[58] **Field of Search**.....110/8 R, 18, 8 A, 8 C; 34/72 432/72

[56] **References Cited**

UNITED STATES PATENTS

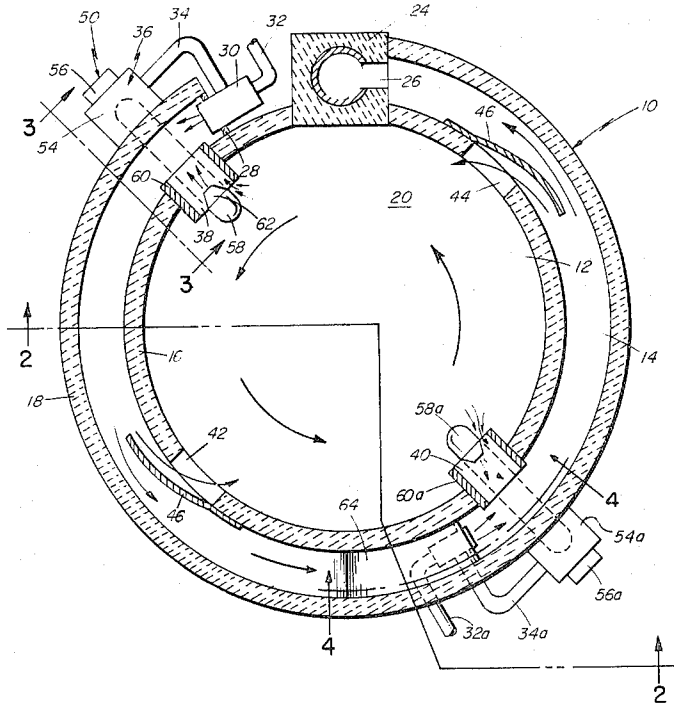
3,654,881	4/1972	Bowles	110/8 C
3,482,532	12/1969	Moushegian et al.	110/8 A
3,111,097	11/1963	Dodge	110/18 R
2,146,531	2/1939	Craigie	110/18 A
1,799,702	4/1931	Puening	432/72
3,557,726	1/1971	Montgomery	110/18

Primary Examiner—Kenneth W. Sprague
Assistant Examiner—Henry C. Yuen
Attorney, Agent, or Firm—Harold A. Murphy; Joseph D. Pannone; John T. Meaney

[57] **ABSTRACT**

An incinerator having means for achieving particularly efficient disposal of trash products, and which comprises primarily a centrally located trash compartment and an encircling afterburner having one or more burners therein with communicating means therebetween to provide controlled air circulation whereby combustion products from the trash chamber will circulate through the after burner for incineration.

11 Claims, 5 Drawing Figures



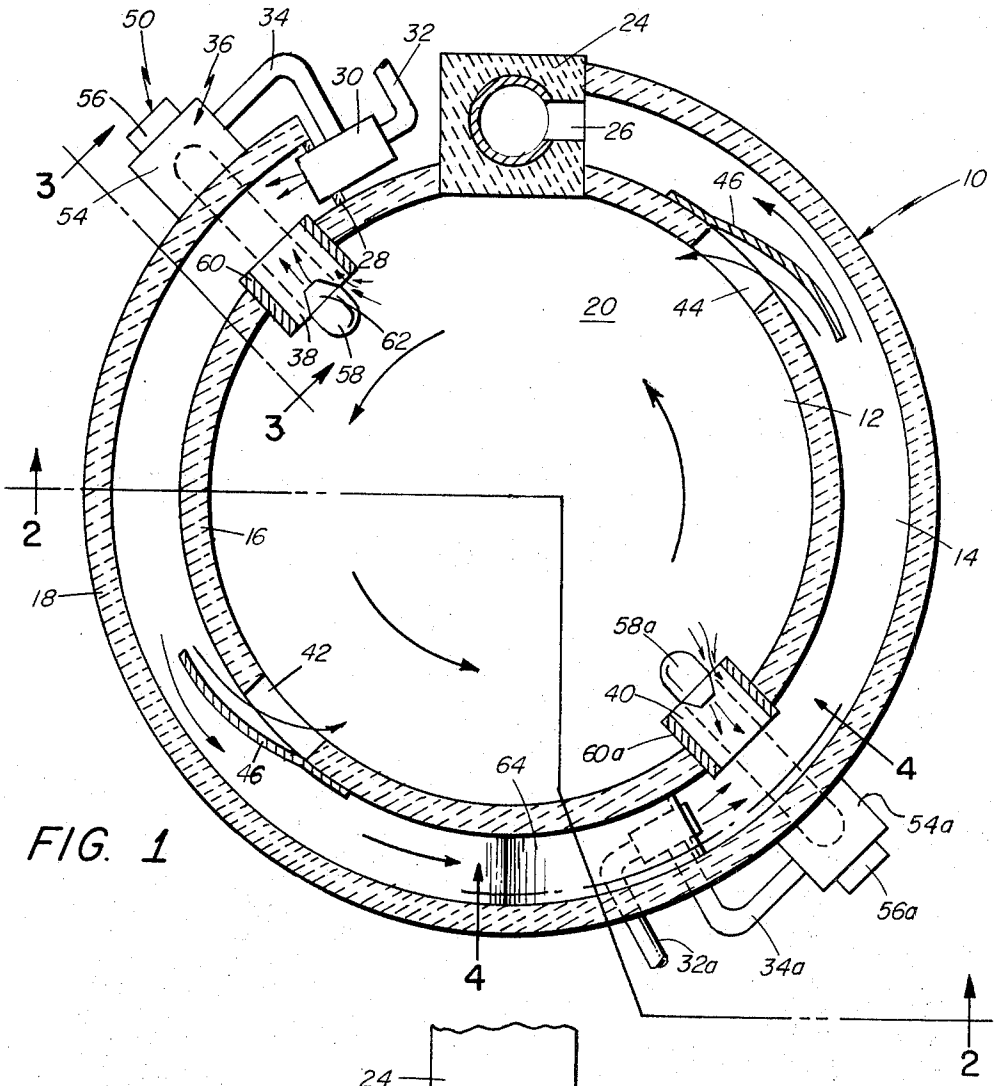

50
36
34
32
30
24
56
26
3
54
46
10
60
28
20
44
62
38
58
3
12
2
16
14
18
58a
42
40
60a
4
64
46
54a
56a
4
32a
34a
2

FIG. 1

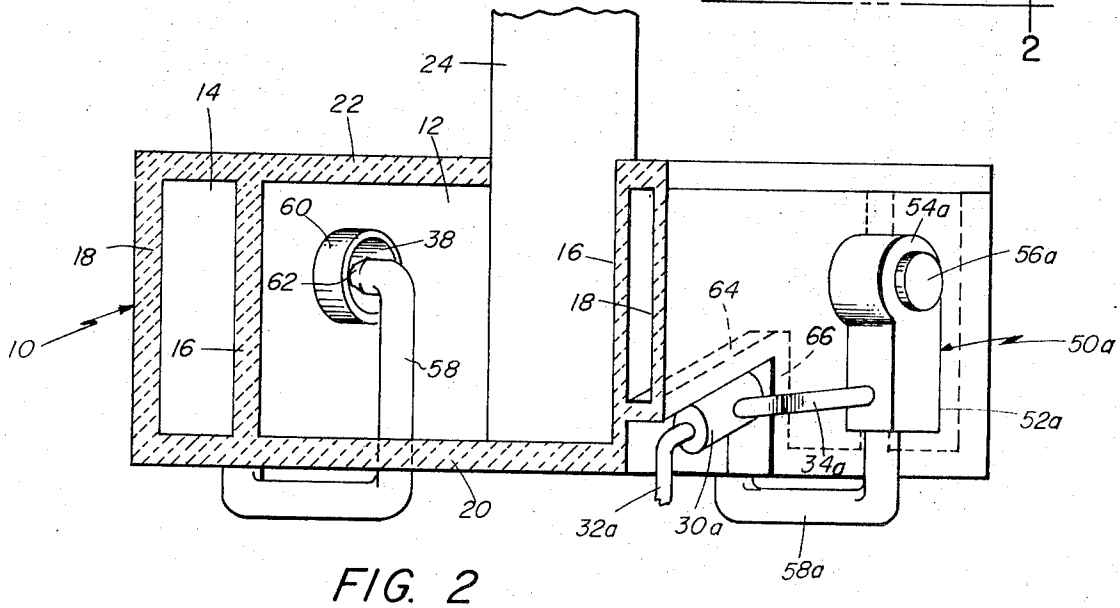

24
14
22
12
60
38
54a
18
62
16
56a
16
18
64
10
66
50a
16
58
52a
34a
20
32a
30a
58a

FIG. 2

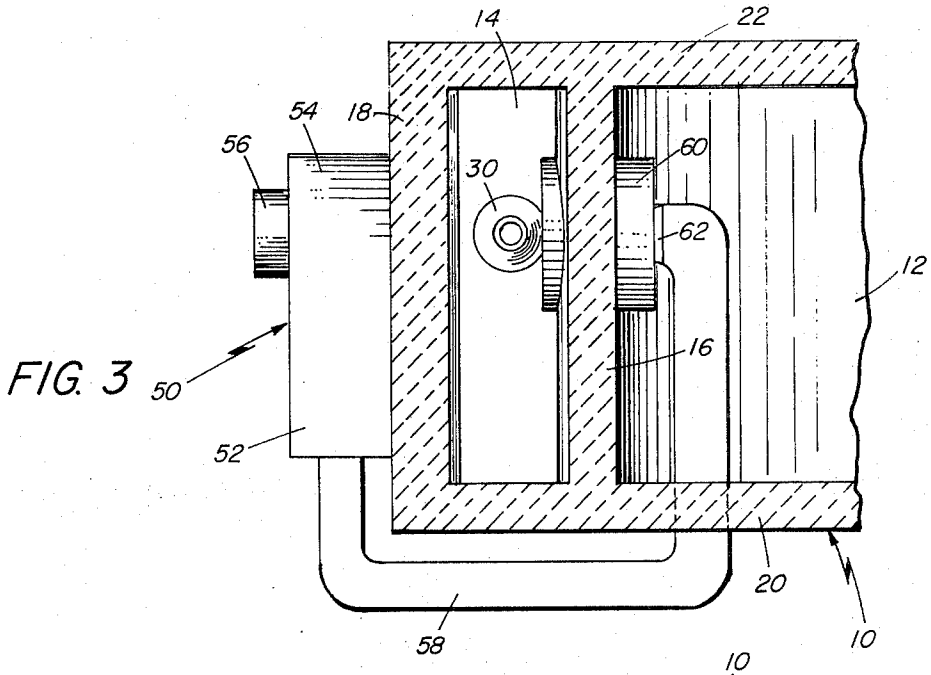


FIG. 3

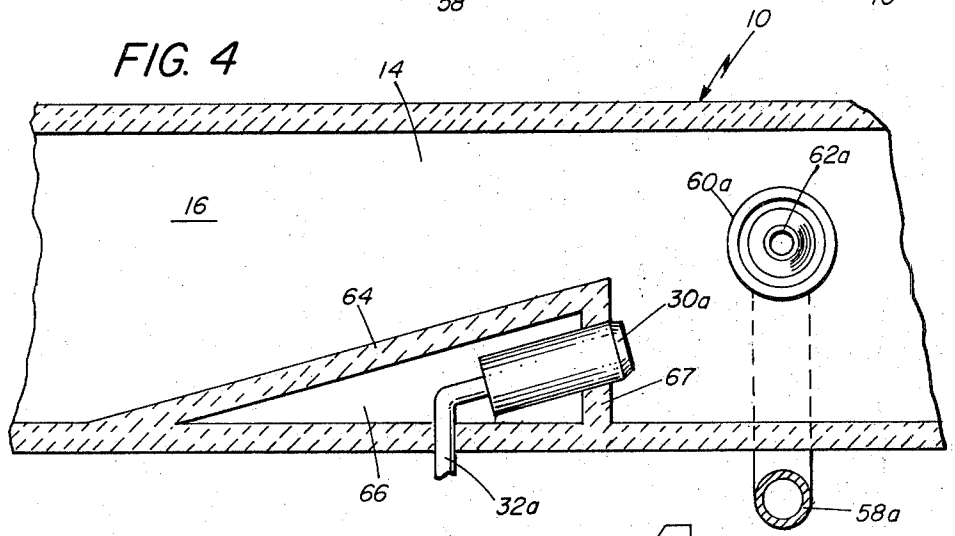


FIG. 4

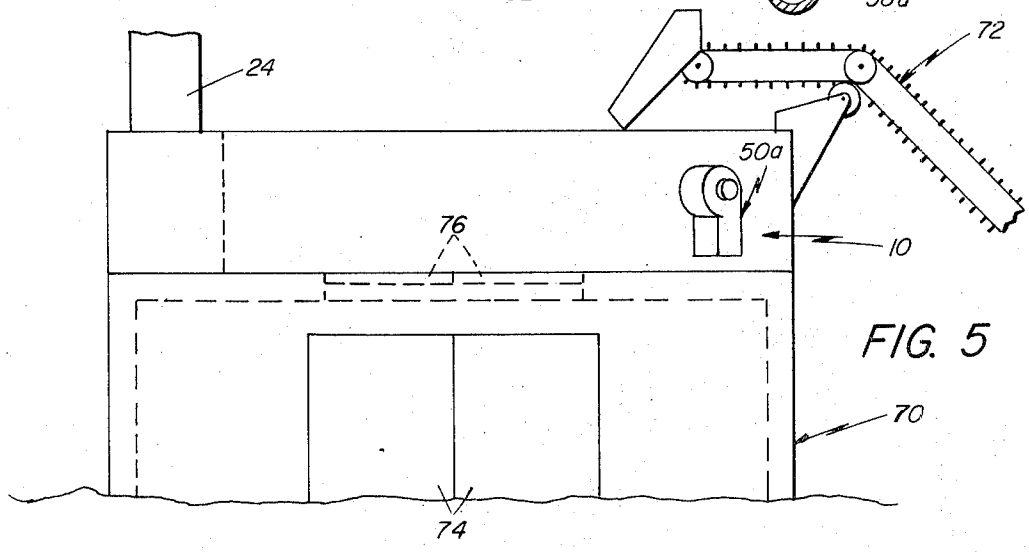


FIG. 5

CYCLONIC FLOW INCINERATOR

BACKGROUND OF THE INVENTION

In operation of known incinerators the matter of complete incineration is a serious problem. Also of considerable importance is the present day requirement for low pollution systems. The design of known incinerators is such that incineration is generally relatively incomplete or inefficient, resulting in considerable residue and ash following an incineration cycle. Furthermore, in such known devices combustion products in the form of gases and some amounts of particulate matter are often passed into the flue and exhausted into the atmosphere as undesirable pollutants.

SUMMARY OF THE INVENTION

The present invention improves upon or overcomes the problems discussed above and other problems associated with known incinerators by the provision of a novel structure which more completely incinerates combustible products and which adds little or no pollutants to the atmosphere during an incinerating cycle. This is achieved by a centrally located trash chamber encircled by an afterburner which contains one or more burners. The burners are positioned to heat the afterburner to the desired temperature, and strategically located ports in the wall between the chamber and afterburner allow hot gases in the afterburner to flow into the chamber whereupon combustion of the trash in the chamber will take place with resultant extremely small deposits of residue.

In further accordance with the invention, additional wall porting and pumping means are provided to permit recirculation of combustion products from the chamber into the afterburner where these products are incinerated. A flue is connected with the afterburner whereby resulting hot nonpolluting gases are exhausted.

A further objective of this invention is the provision of an incinerator of the above character which lends itself to modular construction so that the size of the trash chamber and afterburner-combustion chamber may be chosen for the particular refuse to be incinerated, the method and dimensions of loading systems to be used, and the desired means and frequency of ash removal. The incinerator of this invention may be custom designed simply by choosing the appropriate component parts, all interchangeable, which makes the invention particularly desirable for industrial applications where the greatest variety exists.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objectives and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a top plan view of an incinerator embodying the invention with the top or roof removed to show the internal structure;

FIG. 2 is a vertical sectional view taken on line 2—2 of FIG. 1 and looking in the direction of the arrows;

FIG. 3 is a vertical sectional view taken on line 3—3 of FIG. 1 and looking in the direction of the arrows;

FIG. 4 is an enlarged vertical sectional view taken on line 4—4 of FIG. 1 and looking in the direction of the arrows; and

FIG. 5 is an elevational view of an example of a modular type industrial incinerator embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to the drawings wherein like characters of reference designate like parts throughout the several views, there is shown in FIG. 1 an incinerator embodying the invention. This incinerator, indicated generally by numeral **10**, is intended for commercial or industrial use. However, it will be understood that the features of the invention may be applied to other incinerators such as, for example, municipal, household types used in basements, under counters in kitchens, or the like.

The incinerator **10** comprises a trash chamber **12** which is centrally located within an encircling afterburner **14**. The chamber **12** is defined by a circular wall **16** which is formed of refractory material which separates the chamber from the afterburner **14**. An outer wall **18** spaced from inner wall **16** defines the afterburner **14**. Both the chamber **12** and the afterburner **14** share a common refractory floor **18** and roof **22** so that they are completely enclosed. The afterburner, however, is interrupted by a flue or chimney **24** with which it communicates through opening **26**.

The end wall **28** of the afterburner **14** on the side opposite opening **26** is spaced slightly from the flue **24** to provide space for installation of a burner **30** therein. The burner **30** may be of any suitable type, electric or fluid-fueled, and is shown as a gas burner which is supplied by gas through pipe **32** which may be connected to any suitable external source of fuel, not shown. Air is supplied to the burner for mixture with the gas, to provide combustion, through pipe **34** which is connected to an external air supply system **36** to be described.

The inner wall **16** between the chamber **12** and the afterburner **14** is provided with a port or opening **38** spaced slightly in advance of end wall **28** to allow combustion products from within chamber **12** to flow into the afterburner as indicated by the arrow therein. A similar port **40** is located in wall **16** diametrically opposite port **38** for the same purpose. Since this incinerator is a recirculating type, however, a pair of additional ports **42** and **44** are located respectively in the wall between ports **38** and **40** as shown. Deflectors **46** and **48** are attached to the wall **16** within the afterburner adjacent each port **42–44** to deflect a portion of the gases from within the afterburner **14** through ports **42–44** into chamber **12**. The ports **38–40–42–44** may be made in any desirable manner as single large openings or a group of small openings, as desired.

The charge to be incinerated may be deposited in the trash chamber **12** through doors, not shown, in roof **22**. The charge is intended to be burned therein by means of a hot turbulent flame from the burner **30**, which flame heats the afterburner and creates hot gases which flow through ports **42–44** into the trash chamber **12** to incinerate the charge therein. Combustion products consequently formed in the chamber **12** pass through the ports **38–40** into the afterburner **14** where they become incinerated. Thus, no pollutants or at most very small amounts thereof will remain in the hot gases which are subsequently exhausted into flue **24**.

Mounted in a suitable position such as on the outer surface of outer wall **18** is an air supply system **50** which comprises a plenum chamber or manifold **52** which is connected to a volute **54** having the usual motor **56** and fan (not shown) which thus form a pump. Pipe **34** is connected to the plenum chamber **52** by means of which air is supplied to the burner **30.**

For providing a controlled jet stream of air for circulation through the system, there is provided a piping **58** which has one end connected to the plenum chamber **52,** and its other end extends into trash chamber **12** and terminates adjacent one end of a conduit or venturi **60** which is mounted at its other end in port **38.** The pipe **58** may extend as desired from the plenum chamber **52** to the trash chamber **12** and is shown for convenience as being directed from the plenum chamber downwardly, beneath the floor under the afterburner, and up into the trash chamber through the floor **20** (FIG. **3**). However, any other means may be employed to transfer air under pressure into venturi **60.**

The inner end of pipe **58** has a nozzle **62** which is located adjacent the end of conduit **60,** as shown best in FIGS. **1** and **2,** and which is smaller in diameter than the inside of the conduit so that air may be injected directly from the nozzle into the conduit while circulation air and combustion products from the trash chamber **12** will simultaneously flow into the conduit around nozzle. This feature provides controlled oxygen levels and may be regulated by suitable valves in pipe **58.**

To complete the recirculation system, air and gases within the afterburner **14** will recirculate back into the trash chamber **12** through ports **42–44** as described. This generates a cyclonic flow within the trash chamber as indicated by the arrows in FIG. **1.**

A second air pumping system **50***A*, similar to system **50,** is mounted on outer wall **18** and comprises plenum chamber **52***A*, volute **54***A* and motor **56***A*. Pipe **34***a* connects plenum chamber **52***a* with butner **50***a*, and pipe **58***a* connects the air supply system to port **40.** Thus a second complete air supply system is provided to assist in the recirculation of air throughout the incinerator as a supplement to first air supply system **50.**

It will be apparent that if the incinerator **10** is of relatively large size, one burner **30** will be insufficient for proper and efficient incineration of large charges in chamber **12.** Therefore, in accordance with this invention one or more additional burners may be provided. In the drawings one such additional burner is shown, located diametrically opposite the first burner **30.**

The second burner **30***a* is mounted beneath a ramp **64** in the floor of the afterburner, as shown best in FIGS. **2** and **4.** The ramp **64** thus provides a space **66** within which burner **30***a* may be installed in a wall **67** so as to direct its flame into the afterburner. Burner **30***a* is located adjacent port **40** which contains a conduit **60***a* similar to conduit **60.**

In operation of apparatus of this character, when the burners **30—30***a* are operated simultaneously with blowers **50—50***a*, hot burner gases are directed into the afterburner **14** toward the flue **24.** Some of these gases will pass into the trash chamber **12** in a recirculating pattern through ports **42–44.** All gases from the trash chamber **12** pass through ports **38–40** into the afterburner **14** and mix with the burner flames, effecting complete combustion of smoke and odors. Thus the afterburner **14** becomes a volatiles combustion chamber. Part of this mixture of combusted gases passes through ports **42–44** back to the trash chamber **12** and becomes the source of heat by means of which the trash is heated and burned.

It will be apparent that means may be provided for controlling the initial inflow of air into the afterburner so that the afterburner will become preheated before combustion of trash in chamber **12,** thus avoiding the production of unburned smoke, odors and other pollutants during the early moments of an incineration cycle.

Referring now to FIG. **5,** there is shown a modular incinerator construction for commercial or industrial use wherein a building **70** is located on or below ground surface and supports the incinerator **10** described above. A conveyor **72,** for example, may be employed to deposit trash or refuse in the trash chamber, while doors **74** in the building may be opened to permit trucks or other vehicles to move periodically into a position beneath trap doors **76** in the floor of the trash chamber to remove the small amounts of ash which form the residue of incineration.

It will be apparent that with such a modular construction as described here various sizes of components can be easily selected and assembled to create incinerator systems of the particular sizes and capacities desired.

From the foregoing it will be apparent that all of the objectives of this invention have been achieved by the structures shown and described. It will be understood, however, that various changes and modifications in the structures shown and described may be made by those skilled in the art without departing from the spirit of the invention as expressed in the accompanying claims. Therefore, all matter shown and described is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. An incinerator comprising a centrally disposed main combustion chamber, an afterburner chamber encircling the main combustion chamber, burner means in said afterburner chamber, a wall separating said chambers, and at least two spaced port means in said wall for circulation of gases therethrough between said chambers, and an exhaust flue connected with said afterburner chamber.

2. An incinerator as set forth in claim **1** having pump means operatively connected with one chamber for circulating gases between said chambers through said port means.

3. An incinerator as set forth in claim **2** wherein said pump means has a portion located in said main combustion chamber adjacent one of said port means for introducing air under pressure through said adjacent port into said afterburner chamber.

4. An incinerator as set forth in claim **3** wherein a venturi is disposed within said port means, and said portion of the pump means comprises a nozzle within and smaller than said port means whereby air passing from said nozzle into the venturi will draw with it gases from the main combustion chamber.

5. An incinerator comprising a trash chamber, an afterburner chamber encircling said trash chamber, a wall between the trash chamber and afterburner chamber, burner means within the afterburner chamber, a first port in said wall adjacent said burner, and pump means in said trash chamber adjacent said port for introducing air under pressure through said port into the afterburner, and a second port in said wall spaced from said first port for permitting flow of air and gases from the afterburner chamber into the trash chamber.

6. An incinerator as set forth in claim 5 having an exhaust flue connected with said afterburner chamber.

7. An incinerator as set forth in claim 5 having a second burner in said afterburner chamber, a third port adjacent said second burner, a fourth port spaced from said third port, and second pump means in said afterburner adjacent said third port.

8. An incinerator as set forth in claim 5 wherein baffles are located in said afterburner chamber adjacent each port, said baffles being disposed to intercept only a portion of the air-gas mixture passing through the afterburner chamber for deflecting said portion back through the ports into the trash chamber.

9. An incinerator comprising a central combustion chamber, an encircling afterburner chamber separated from said combustion chamber by an annular wall, burner means in said afterburner chamber for heating gases therein to combustion temperatures, at least two spaced port means in said wall, and recirculation means for circulating air-gas mixtures back and forth between the chambers, and an exhaust flue connected with said afterburner chamber.

10. An incinerator as set forth in claim 9 wherein said recirculation means comprises pump means adjacent one of said port means for directing air and gas from the central combustion chamber into the afterburner chamber, and deflector means for guiding circulation of said air and gas back into the central combustion chamber through a different port means.

11. An incinerator as set forth in claim 10 wherein said deflector means are located in said afterburner chamber adjacent said additional port means for intercepting and deflecting into the central combustion chamber a portion only of the air and gas flowing through the afterburner chamber.

* * * * *