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Oseroff et al.

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[54] **APPARATUS FOR PULVERIZING AND INCINERATING HOUSEHOLD WASTE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 248,923, May 1, 1972, abandoned.

[52] **U.S. Cl.** ..... **110/8 R,** 110/8 C, 110/18 R, 110/119

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

[58] **Field of Search** .. 110/7 R, 8 R, 8 C, 8 A, 18 R, 110/18 C, 119

[56] **References Cited**

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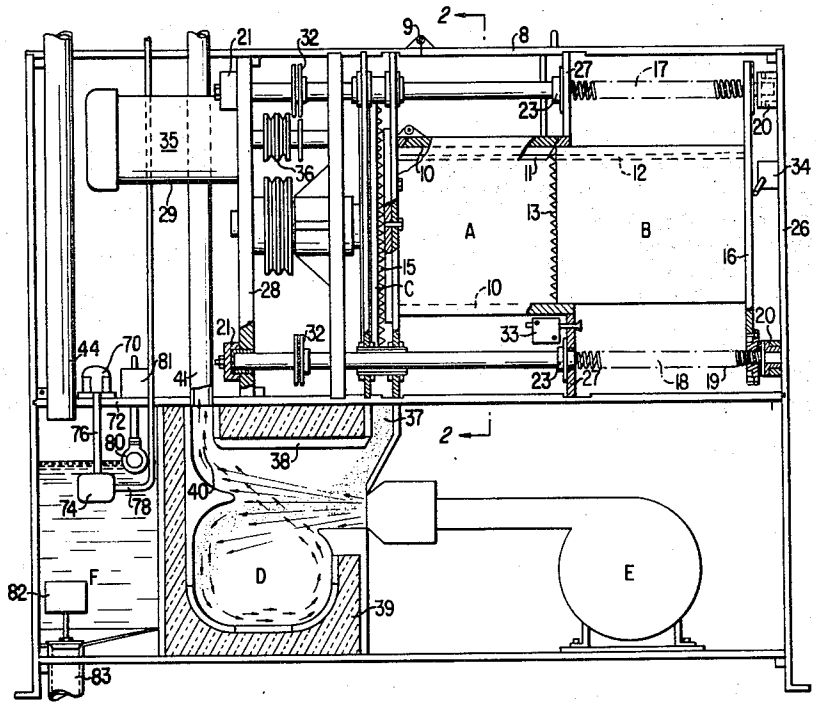
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Primary Examiner—Kenneth W. Sprague
Assistant Examiner—James C. Yeung
Attorney, Agent, or Firm—Donald D. Jeffery

[57] **ABSTRACT**

Apparatus for totally reducing refuse, such as paper, cardboard, plastics, tin cans and glass, into a granular state of such fine grit that it can then be explosively ignited and reduced further to a smokey remain. This smokey remain is then condensed by a chemical wash and directed to a liquid tank, from which the liquid is flushed away into the sewage system.

11 Claims, 5 Drawing Figures



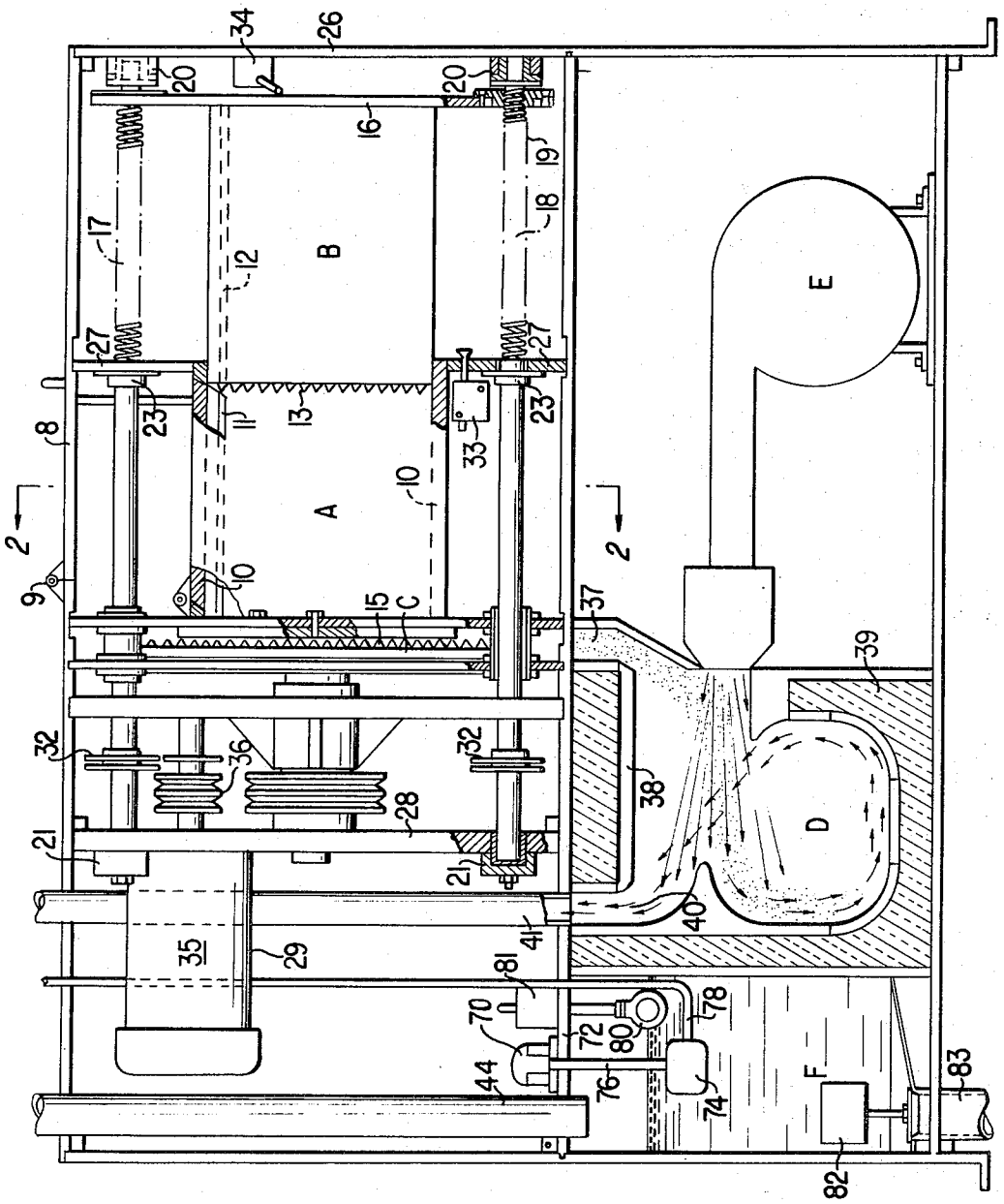


FIG. 1

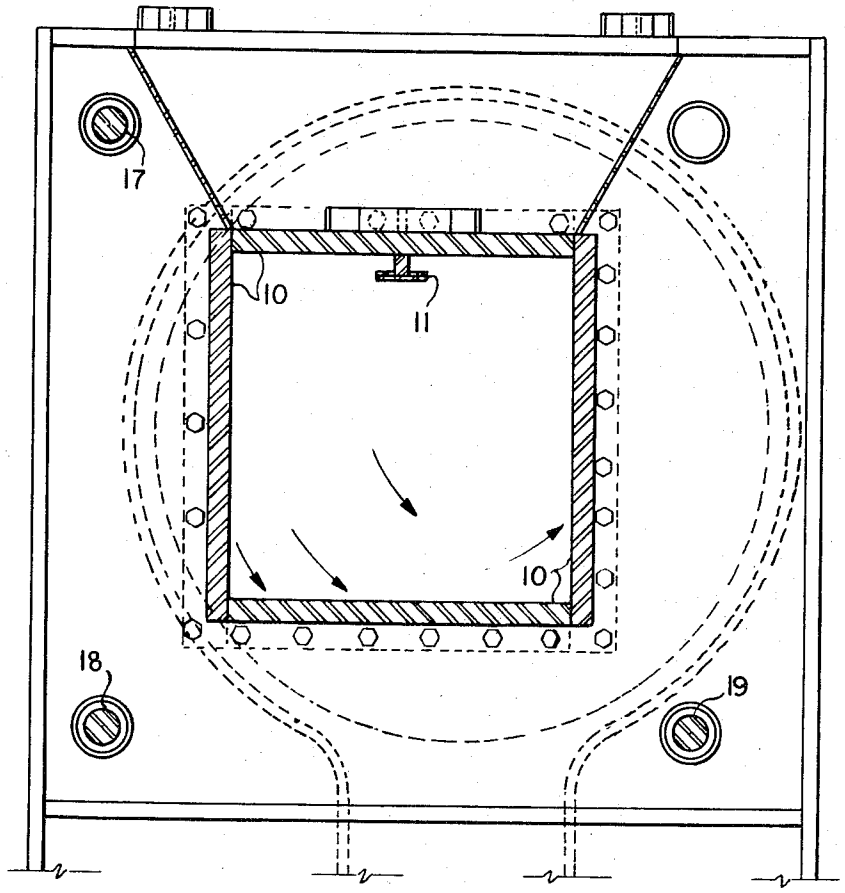
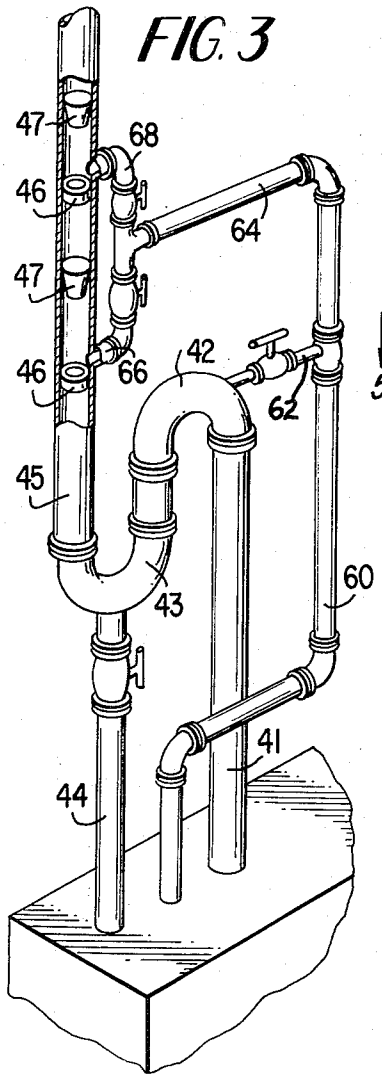


FIG. 2.

FIG. 3



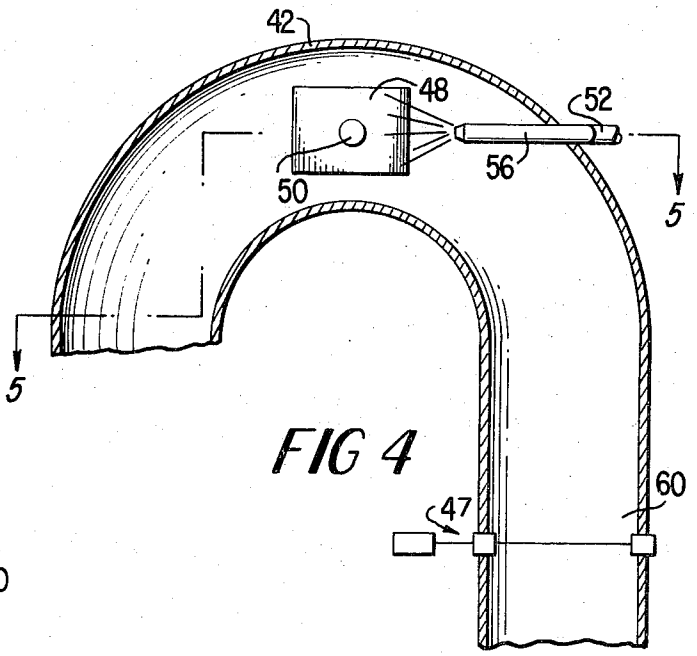
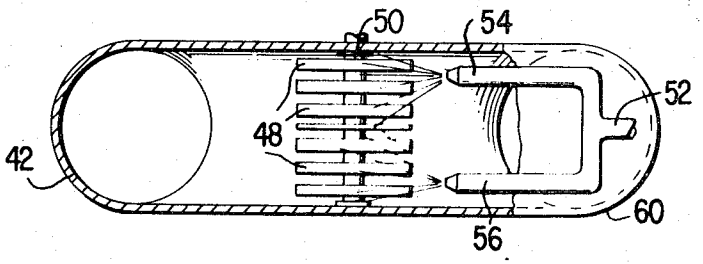


FIG 4

FIG 5



APPARATUS FOR PULVERIZING AND INCINERATING HOUSEHOLD WASTE

CROSS-REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part of our application Ser. No. 248,923, filed May 1, 1972 now abandoned, and bearing the same title.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates as indicated to apparatus for pulverizing and incinerating household waste, and relates more particularly to apparatus capable of handling essentially all types of waste or refuse at the source and reducing such refuse to a liquified ash which can be safely discharged into the sewer system.

2. Description of the Prior Art

In my prior U.S. Pat. No. 3,550,541 granted Dec. 29, 1970, there is described and claimed a receptacle for receiving refuse fed by gravity against a pulverizing disc, after which the refuse is discharged in a comminuted state onto an endless belt in a combustion chamber wherein it is incinerated. The combustion chamber is provided with a removable ash receptacle and a flue for removing the products of combustion.

SUMMARY OF THE INVENTION

In accordance with the invention, the refuse is finely ground and burned at elevated temperatures so as to reduce the refuse to smoke after which the smoke is condensed by a liquid wash and directed to a liquid tank within the apparatus for discharge into the sewer system. The apparatus is compact and thus suitable for home or apartment house use, and is essentially automatic. The apparatus is ideally suited for densely populated areas and serves to reduce environmental pollution.

The present invention utilizes a pulverizing disc faced with a hard tool steel against which the refuse is forced by a pressure ram. The granulated particles are delivered to an ignition chamber where they are explosively ignited by a burner of metal melting type producing temperatures in excess of 1,300°F to reduce the particles to smoke which passes to an emmission chamber. The emission chamber is equipped with a vaporizing unit that condenses the smoke into a liquid which is thoroughly diluted and washed, and eventually flushed away.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical section partially in elevation of the apparatus of the present invention;

FIG. 2 is a transverse sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a top perspective view of the apparatus partially broken away, showing in detail the sections of the apparatus for washing the smoke and venting the remaining products of combustion;

FIG. 4 is an enlarged sectional view through the washing section of the apparatus, and

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the application drawings, wherein like parts are indicated by like reference characters, and initially to FIG. 1, A is the refuse receptacle, B a pressure ram, C a pulverizer wheel, D an ignition or incinerator chamber, E a burner and F a dilution tank which receives the liquefied particles.

The receptacle A has peripheral walls **10**, referring to FIG. 2, the top one of which has a T-shaped guide **11** which extends into a correspondingly shaped guide way **12** formed in the pressure ram B. The ram B is provided with teeth **13** on the end wall thereof facing the receptacle A. A top cover **8** is provided hinged at **9**, for feeding refuse into the receptacle. The top wall **10** of the receptacle A is also hinged as shown for access to the receptacle.

The pulverizing wheel C has teeth **15** of hard tool steel such as "Firthite Sterling," and the refuse in the receptacle A is forced against wheel C under pressure of ram B. Ram B is mounted on plate **16** and the ram is reciprocated relative to the walls of receptacle A by three worm screws **17, 18** and **19** which have their ends journaled in bearings **20** mounted on end wall **26** and bearings **21** mounted on wall **28.** Intermediate supporting bearings **23** are provided which are mounted on partition wall sections **27** which extend around and support the receptacle A. Screws **17, 18** and **19** are driven by a motor **29** mounted on partition wall **28** having sprocket wheels **32** for drive belts (not shown). Motor **29** is positioned behind motor **35** in FIG. 1 and is thus not visible in this figure. A limit switch **33** limits the forward movement of travel of ram B and a limit switch **34** mounted on end wall **26** limits the rearward movement of the ram.

Pulverizing wheel C is driven by a separate motor **35,** and sheave wheels **36** for V belts are driven by the motor **35** thereby permitting the wheel C to remain traveling at its high RPM unaffected by the reversing action of the ram B.

The ignition chamber D is located below the pulverizing wheel C, and the pulverized refuse is gravity fed into the ignition chamber through passage **37** located immediately below the wheel C.

A burner E is mounted on the bottom wall of the apparatus below the receptacle A and ram B and directs a high temperature flame into the ignition chamber D. Burner E is preferably of the type for smelting bronze and other metals in foundaries, and reaches temperatures in excess of 1,300°F. The jet action of the flame circulates the pulverized particles in the chamber D, with the latter being provided with a refractory lining **38** with insulation backing **39.** The products of combustion or smoke pass from the ignition chamber D through outlet **40** to discharge pipe **41.**

Referring now to FIG. **3,** there is illustrated therein the sections of the apparatus for washing the products of combustion thereby condensing the same for return to the dilution tank F, and for venting the remaining products of combustion from the apparatus. Only the top wall of the main part of the apparatus has been illustrated in FIG. **3.**

The upper end of the discharge pipe **41** terminates in an inverted U pipe section **42** in which the smoke is condensed and liquefied by chemical washing action as will be hereinafter described when specific reference is

made to FIGS. 4 and 5. The liquefied particles gravitate downwardly through pipe section 43 to a return pipe 44 which extends downwardly through the apparatus and terminates above the liquid level in the tank F, as can be seen in FIG. 1. The products of combustion which have not been condensed in the section 42 pass upwardly through vent pipe 45 in which are positioned at predeterminedly spaced intervals atomizer spray rings, commonly designated at 46 and conical soot traps commonly designated at 47. Chemical wash liquid is directed to the spray rings 46 for condensing to the extent possible the products of combustion passing upwardly through the vent pipe 45, with the soot traps 47 functioning to collect soot particles which pass upwardly through the pipe. The products of combustion are thus subjected to a chemical was liquid both in the pipe section 42 and the vent pipe section 45 which, coupled with the soot traps 47, ensures that the products of combustion passing upwardly through the vent pipe 45 are relatively clean thereby permitting such products to be passed to the atmosphere without polluting effect. The upper end of the vent pipe, which is shown broken in FIG. 3, is vented to the atmosphere in a manner well understood by those skilled in the art.

Referring to FIGS. 4 and 5, which illustrate in enlarged view the manner in which the smoke is chemically washed, disposed in pipe 41 is a charging device 47 which functions, when energized, to emit a negative current thereby causing the smoke rising upwardly in the pipe to acquire a negative charge. Located in the section 42 of the pipe are a series of positively charged plates commonly designated at 48 which are mounted within the pipe section on a shaft 50 which extends through the walls of the pipe in seal relation and is connected to a source of electrical energy for positively charging the plates 48.

As the smoke discharged through outlet 40 rises in the pipe 41, the smoke is first negatively charged as described and the thus charged particles are thereafter attracted by the positively charged plates 48 and deposited thereon. Smoke which is not deposited passes through the plates 48 and upwardly from the apparatus through the vent pipe 45 as previously described.

A wash jet 52 having bifurcated jet sctions 54 and 56 is mounted adjacent the pipe section 42, with the ends of the jets extending through the walls of the pipe section and terminating relatively adjacent the charged plates 48. The jets 54 and 56 direct a chemical washing liquid over the surfaces of the plates 48 thereby condensing the particles deposited on the plates and producing a liquefied waste product. Such product in liquefied form descends through pipe section 43 to return pipe 44 for passage to the dilution tank F.

Referring again to FIG. 3, a chemical wash line 60 supplies washing liquid to the jets 54 and 56 through line 62, and branch 64 of the line 60 supplies washing liquid to the atomizer spray rings 46 through branch lines 66 and 68. As shown, suitable control valves are provided to regulate the flow to the spray rings and the jets 54 and 56.

The washing liquid is circulated and recirculated by means of a pump comprising a motor 70 mounted on intermediate wall 72 of the apparatus and an impeller 74 operatively connected to the motor through shaft 76. The impeller outlet communicates with discharge line 78 which in turn communicates with the wash line 60 illustrated in FIG. 3. It will be understood that the pump is shown only schematically in FIG. 1 inasmuch as this is a commercially available item of the type wherein the impeller is adapted to be submerged in the liquid to be circulated. In this regard, it will be noted that the impeller 74 is positioned below the liquid level in the tank F.

To facilitate the liquefying of the charged particles on the plate 48, chemical additives are preferably employed in the washing liquid, and these additives may be supplied directly to the tank F for recirculation as described, or can be supplied by separate lines to the branches 62 and 64 of the wash line piping for supply to the jets 54 and 56 and the atomizer spray rings 46. In either event, the chemical additives are diluted by water in the tank F and cause no harmful polluting effect when discharged from the apparatus as will be presently described.

The liquid level in the dilution tank F is regulated by an overflow pipe 80 and an electrically operated level control switch 81. When the full level is reached in tank F, the tank is emptied by an electrically operated drainage valve 82 above the sewer connection 83. Water can be added to the tank in any suitable, known manner.

It will thus be seen that the apparatus of the present invention offers many advantages. The apparatus is simply constructed and comprises relatively few parts. The operation is essentially automatic after the refuse has been fed into the receptacle A and the ram B actuated. The end product of the system comprises a liquified ash which is diluted in tank F for non-harmful discharge into the sewer system. There is no accumulation of residue due to the high temperature burner employed thereby making the apparatus ideal for use in private homes, apartment houses, and the like. It will be apparent that various modifications can be made in the apparatus described without, however, departing from the principals of the present invention as defined in the claims appended hereto.

We claim:

1. Apparatus for pulverizing and incinerating waste products comprising:

a. a refuse receptacle having a rotary pulverizing device positioned at one end thereof and means for rotating said device,

b. means for feeding the refuse into contact with said rotary pulverizing device under pressure for pulverizing such refuse,

c. an incinerator chamber having an inlet communicating with said refuse receptacle generally below said rotary pulverizing device and an outlet adjacent the opposite end thereof,

d. a burner mounted adjacent said incinerator chamber below said inlet and outlet for projecting a high temperature jet flame into said chamber for reducing the refuse to smoke, said chamber being formed with means for diverting a substantial portion of said refuse and said jet flame downwardly and around said incinerator chamber and upwardly through said projected jet flame and the incoming refuse thereby to effect substantially complete incineration of such refuse,

e. liquefying means communicating with said incinerator chamber for receiving smoke from said incinerator and condensing said smoke to a liquid form, and

f. means for receiving and diluting said liquid prior to removal from said apparatus.

2. The apparatus of claim **1** in which said means for feeding the refuse under pressure to said pulverizing device consists of a ram having motor driven feed screws and having limit switches in the path of movement of said ram for controlling the movements thereof, said ram travelling from a retracted position at one side of said refuse receptacle to an advanced position closely adjacent said rotary pulverizing device for pulverizing said refuse.

3. The apparatus of claim **2** in which the pulverizing device is a motor driven rotary disc having a hard tool steel toothed face exposed to the refuse in said receptacle, and said ram is provided with a toothed face adapted to confront the teeth of said pulverizing disc when said ram is in its advanced position.

4. The apparatus of claim **3** in which the said pulverizing disc and said feed screws for said ram are driven by individual motors separately controlled thereby permitting said disc to be rotated while said ram is moved to a retracted position.

5. The apparatus of claim **1** wherein said means for receiving and diluting said liquid comprises a tank, and means for controlling the discharge of said diluent from said tank to an adjacent sewer drain.

6. The apparatus of claim **1** wherein said liquefying means comprises jet washing means positioned within the discharge pipe for the smoke from said incinerator chamber, said jet washing means condensing said smoke to a liquid product, and pipe means for returning said liquid product to said receiving and diluting means.

7. The apparatus of claim **6** wherein said receiving and diluting means comprises a tank into which the liquid products are directed for diluting the same prior to discharge from the apparatus.

8. The apparatus of claim **6** further including means for collecting said smoke particles for maximum exposure of said particles to said liquid wash comprising means in said discharge pipe for negatively charging said particles, and a plurality of positively charged plates in said discharge pipe above said negative charging means and located adjacent said jet washing means for collecting said charged particles, said jet washing means impinging on the surfaces of said plates thereby liquefying said particles.

9. The apparatus of claim **8** further including vent pipe means upstream of said liquefying means for discharging from said apparatus the non-liquefied products of combustion.

10. The apparatus of claim **9** further including conical soot traps and atomizer spray rings in said vent pipe means for further purifying the smoke prior to discharge from said apparatus.

11. The apparatus of claim **6** wherein said diluting means comprises a tank, and further including means for recirculating the washing liquid comprising pump means having an impeller submerged below the liquid level in said dilution tank and communicating with said jet washing means for supplying washing liquid thereto.

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