Aug. 7, 1962 C. A. MORGAN 3,048,130

INCINERATOR

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FIG. 1

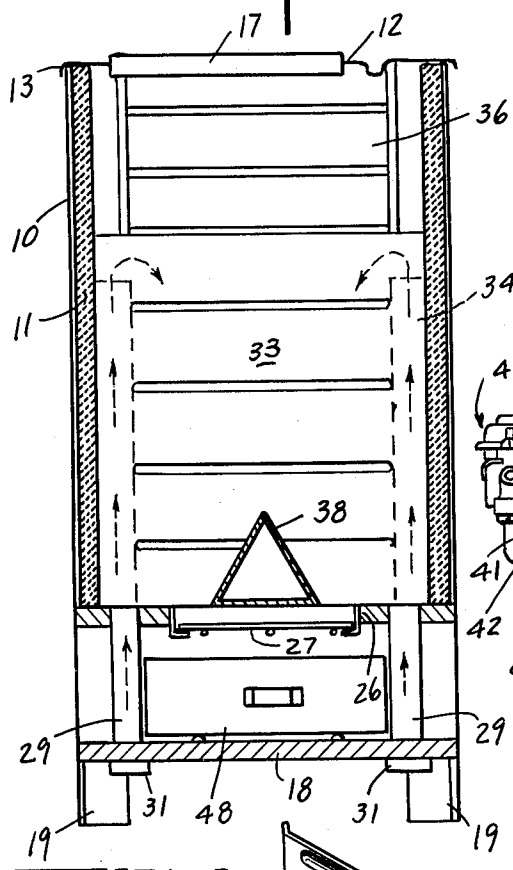


FIG. 2

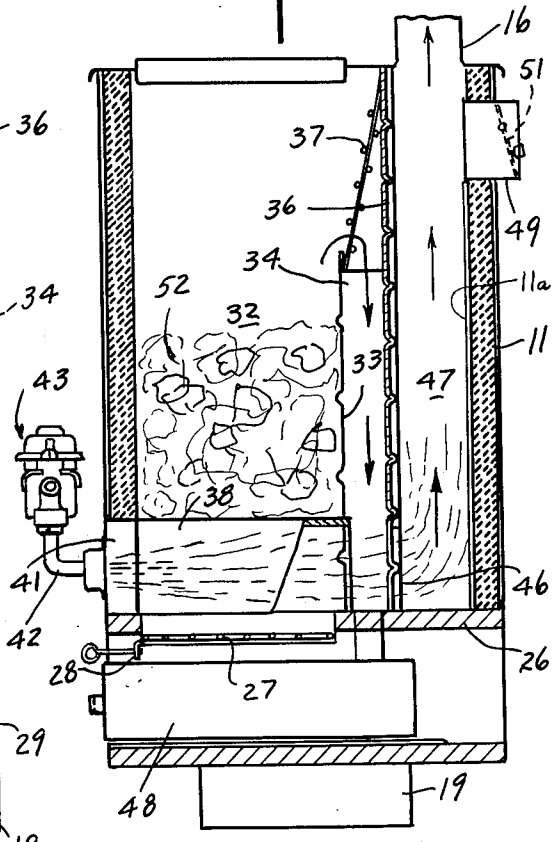


FIG. 4

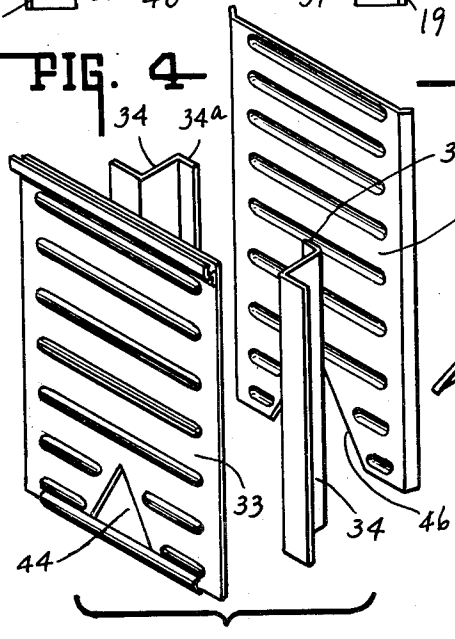
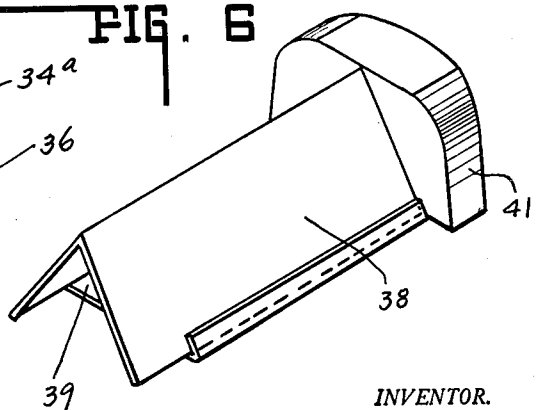


FIG. 6



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FIG. 3

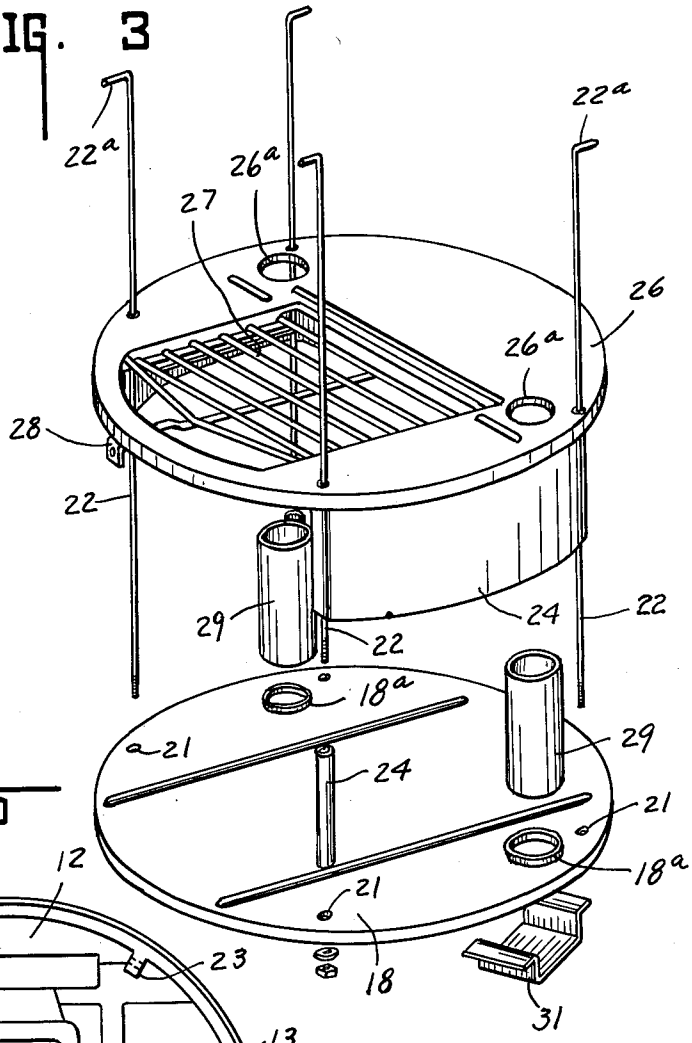
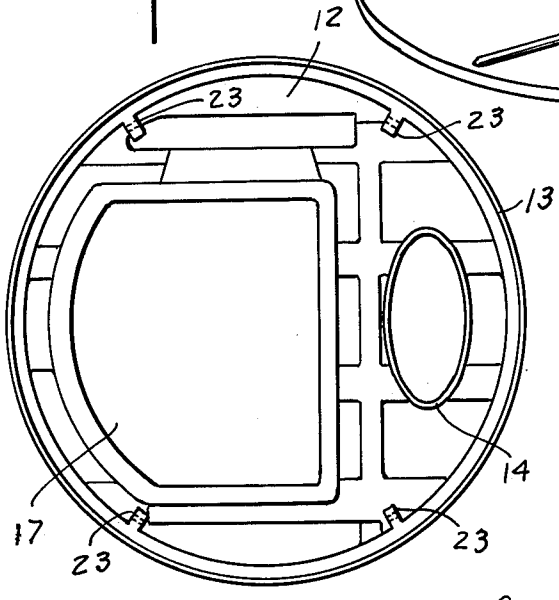


FIG. 5



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3,048,130

Patented Aug. 7, 1962

3,048,130

INCINERATOR

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Filed June 1, 1959, Ser. No. 817,242
3 Claims. (Cl. 110—8)

This invention relates generally to smoke consuming combustion apparatus and in particular to an incinerator for combustible refuse in which smoke odor bearing vapors and fly ash are consumed prior to their admission to the incinerator flue.

In the operation of domestic incinerators of the type referred to herein, the products of combustion of an incinerator charge, composed of smoke, odor bearing vapors and unburned particles, are carried to the flue by convection air currents through the incinerator. It is highly desirable to design the incinerator so that the smoke, vapors and unburned particles issuing from the charge and admitted to the incinerator flue to be maintained at a minimum.

In the apparatus of the present invention, this is accomplished by providing an open-ended member which acts as a flame carrier tunnel through the charge, the heating of the surfaces of the member serving to ignite the charge. Two spaced, approximately parallel plates extending upwardly within the body of the incinerator provide a secondary combustion chamber, the open end of the flame tunnel member being disposed at the base of the secondary chamber. An aperture in one of the parallel plates permits entry of the products of combustion into a final combustion chamber which extends vertically upward through the incinerator and communicates with the flue. The rear face of this final combustion chamber, facing the open end of the flame tunnel, is formed of refractory material which is heated to incandescence by the flame. Since the ignition of the refuse charge is delayed until the tunnel member is brought to charge igniting temperature, the refractory wall of the final combustion chamber is at relatively high temperature by the time the charge is ignited. Air is introduced into the incinerator through its base and flows upwardly through segregated passages. between the generally parallel plates, the segregated passages terminate short of the top of the front plate so that the incoming air moves directly into the secondary chamber between the plates and mixes with the smoke, odor-bearing vapors and unburned particles issuing from the refuse charge and moving into the secondary chamber. The air added to the products of combustion facilitates complete combustion as the products move through the secondary chamber and the final chamber to the flue. Impingement of the smoke and unburned particles on the glowing rear wall of the final combustion chamber further aids in smoke and odor consumption. As a result, a minimum of smoke and odor-bearing vapors are introduced into the incinerator flue, the major portion being consumed upon its entry into and subsequent passage through the final combustion chamber.

It is the primary object of the present invention, therefore, to provide an incinerator wherein smoke, odor-bearing vapors and other solid products of combustion are consumed before their entry into the incinerator flue.

A further object of the present invention is to provide an incinerator having a primary, charge-receiving chamber, a secondary chamber and a final combustion chamber with air introduced at the up-stream end of the secondary chamber and means for introducing flame at the junction of the secondary and final chambers, whereby the smoke and unburned particles from the refuse charge

are completely consumed as they pass through the secondary and final chambers.

A further object of the present invention is to provide an incinerator of the type referred to in which the final combustion chamber is provided with a refractory wall upon which the smoke, odor-bearing vapors and unburned particles entering the final chamber are caused to impinge, the means for introducing flame into the final combustion chamber being such that the refractory wall is already at an elevated temperature when the refuse charge reaches igniting temperature.

A further object of the present invention is to provide an incinerator in which no apertures or openings at the top or upper portion of the incinerator body are required for the introduction of either primary or secondary combustion-supporting air.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is a front sectional view of an incinerator embodying the present invention.

FIG. 2 is a side sectional view of the incinerator shown in FIG. 1.

FIG. 3 is a perspective, exploded view of the base structure of the incinerator.

FIG. 4 is a perspective, exploded view of a component of the incinerator.

FIG. 5 is a bottom view of the top casting for the incinerator.

FIG. 6 is a perspective view of a further component of the incinerator.

Referring initially to FIGS. 1–3, the incinerator is shown as including an outer sealing jacket **10**, circular in cross sectional configuration and enclosing the incinerator side wall **11** which is formed of a refractory material. The upper end of the incinerator is closed by means of a top casting **12**, its downturned margin **13** serving to retain the jacket **10** in place. Casting **12** is provided with an oval aperture **14** to which may be connected a smoke pipe or flue indicated at **16** in FIG. 1. A charge receiving opening in the casing receives a removable closure **17**.

Referring particularly to FIGS. 1 and 3, the base structure of the incinerator includes a circular base plate **18** supported upon legs **19** (FIG. 1). The base plate is apertured at **21** to receive stove rods **22**. The upper ends **22***a* of the rods are received within apertures formed in lugs **23** (FIG. 5) carried by the top casting **12**. A plate **26** is supported in spaced parallel relation to the plate **18** by means of a curved member **24** rigidly attached to and depending from the plate **26**. Mounted within an opening within the plate **26** is a sliding grate **27** which may be manipulated by means of a member **28** accessible at the front of the incinerator, as shown in FIG. 2.

The plates **18** and **26** have registering apertures therein **18***a* and **26***a*, respectively, the tubes **29** enclosing the apertures and extending between the plates. Brackets **31**, secured to the under face of the plate **18** overlie the apertures **18***a*. The apertures and tubes **29** provide a means for introducing air into the incinerator as will subsequently be explained.

Extending vertically upwardly from the plate **26** is a horizontally ribbed steel plate **33** shown in detail in FIG. 4. The plate **33** extends across the side wall of the incinerator, but terminates short of the upper margin of the charge-receiving combustion or burning chamber indicated at **32** in FIG. 2. The plate **33** is supported on vertical brackets **34** which are secured to the rear face of the plate **33** and at their surfaces **34***a* are secured to a second plate **36**. The plate **36** is also formed of steel and horizontally ribbed, extending from side to side of the chamber **32** and upwardly to the top casting **12**. A wire

mesh grill 37 is supported in inclined position between the upper margins of the plates 33 and 36, the grill being shown in FIG. 2, but omitted from FIG. 1.

It will be noted that the apertures 26*a* in the plate 26 are disposed outboard of the bracket 34. Incoming air passing through the tubes 29 thus flows upwardly along the outer sides of the brackets 34 and between the plates 33 and 36. These two segregated air passages terminate short of the upper margin of the front plate 33 since the brackets 34 terminate short of the upper margin of plate 33. Air flowing upwardly along the outer side of the brackets 34, upon reaching the upper ends of the brackets, then is drawn downwardly into the secondary chamber disposed centrally between the plates 33 and 36 and bounded by the inner sides of the brackets. The smoke, odor-bearing vapors and unburned particles issuing from the ignited charge, after entering the central area between the plates (referred to as the secondary chamber), thus have mixed therewith air flowing inwardly over the upper ends of the brackets 34.

Referring now particularly to FIGS. 2 and 6, the flame carrier tunnel member will be described. The tunnnel member comprises an inverted V-shaped channel 38 formed of cast iron, the major portion of the lower face of channel 38 being closed by means of a stainless steel plate 39. A header 41 of refractory material receives one end of the flame carrier tube formed by the members 38 and 39. A burner tube 42 (FIG. 2) introduces gas into the end of the carrier tube where it is aerated and ignited. The aerating and ignition means together with the required safety shutdown control structure are not shown in detail herein since they are conventional and form no part of the present invention. A safety shutdown and control valve structure indicated generally at 43 in FIG. 2 serves to control the flow of gas in conventional fashion through the burner tube 42.

The opposite end of the flame carrier tube extends into a triangularly-shaped aperture 44 (FIG. 4) in the base of plate 33. The lower portion of the plate 36 also has a registering triangular aperture 46. As shown in FIG. 2, the flame is propagated along the carrier tube, passes centrally across the space between the plates 33 and 36 and enters the final combustion chamber 47 which is defined by the space between the plate 36 and the refractory side wall 11. The portion of the refractory wall 11 which forms the rear wall of the chamber 47 may be vertically ribbed as indicated at 11*a*. It will be noted that the ribbed portion of the refractory wall, at its lower end, is subject to direct flame impingement. This refractory wall portion is thus raised to incandescent temperature a relatively short time after ignition of the burner tube. The incinerator structure is completed by an ash pan 48 which is supported on a plate 18. A fitting 49 extending rearwardly from the upper portion of the combustion chamber 47 accommodates a conventional barometric check damper 51 which limits the draft through the chamber 47.

In operation, with the chamber 32 charged with refuse, as indicated at 52 in FIG. 2, and with the gas burner ignited, the side walls 38 of the carrier tube will be raised to the ignition temperature of the charge. The thickness of the side walls of the carrier tube, however, is such that a substantial time prior to their attaining the ignition temperature of the refuse the refractory wall forming the rear face of the final chamber 47 will be heated to incandescence. The smoke, odor bearing vapors and unburned particles move upwardly from the charge and are drawn through the grill 37 and downwardly through the secondary chamber bounded front and back by the plates 33 and 36 and at the sides by the inner faces of the brackets 34. As this material passes through the secondary chamber, air from the tubes 29 is drawn inwardly across the upper margins of the brackets and mixed with the smoke and vapors. The air laden mixture then intersects the flame and is drawn through the aperture 46 in plate 36 subsequently passing upwardly through the final chamber to the flue. The injection of air into the material leaving the ignited refuse, such injection occurring in the secondary chamber, insures complete combustion of the material as it passes through the flame and enters and moves upwardly through the final chamber. Impingement on and passage along the incandescent rear wall of the final chamber further aids in securing complete combustion of the material.

It should be further noted that all of the products of combustion enter the upper area of the final chamber 47 only after passing through the flame distributed across the lower portion thereof. In passing through the flame and along the incandescent rear wall of chamber 47 odor-bearing vapors, smoke and carbon particles are substantially completely consumed so that the smoke content of the gases passing to the flue 16 are at a minimum. The refuse charge is ignited as a result of the flame carrier tube being heated to the ignition temperature of the refuse rather than introducing flame directly to the refuse charge, this providing a delayed ignition of the charge which permits the refractory wall of the final chamber 47 to attain incandescence prior to the passage of smoke laden gases therethrough.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative in character and not restrictive, as modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. In an incinerator of the type having a refractory side wall defining a charge receiving primary combustion chamber and a flue for disposing of combustion gases, a flame carrier tube of generally triangular cross-section mounted to extend transversely through the primary combustion chamber adjacent its base, means for introducing flame into one end of said carrier tube, the opposite end of said carrier tube being open to permit the exit of flame therefrom, said carrier tube being thereby heated sufficiently to ignite the charge in said combustion chamber, a first plate extending across said primary combustion chamber but terminating short of the upper margin thereof, a second plate disposed in spaced parallel relation to said first place and extending to the upper margin of said primary combustion chamber, elements spaced inwardly from the side margins of said first plate and spanning the space between said plates, said elements terminating short of the upper margin of said first plate, said plates and elements defining a generally vertical secondary chamber, means for introducing air into the space outboard of said elements, a wire grid extending between the upper margin of said plates, the open end of said flame carrier tube communicating with the space between said plates, an aperture at the base of said second plate aligned with the open end of said flame carrier tube, said second plate being spaced from said refractory side wall to define therebetween a generally vertically extending final combustion chamber communicating with said flue, the flame propagated through said carrier tube impinging on said refractory wall to raise it to incandescent temperature, whereby products of combustion are drawn by convection across said grid and into said secondary chamber to be mixed with air moving across the upper margins of said elements, the aerated products of combustion moving downwardly through said secondary chamber to enter said final combustion chamber through said second plate aperture and flow upwardly through said final combustion chamber into said flue, the intersection of the flame and the aerated products of combustion at said second plate aperture and their movement along the incandescent refractory wall serving to consume smoke, odor-bearing vapors and particles entrained in the products of combustion.

2. In an incinerator of the type having a refractory side wall defining a charge receiving primary combustion chamber and a flue for disposing of combustion gases, an open-ended flame carrier tube mounted to extend transversely through the primary combustion chamber, means for introducing flame into one end of said carrier tube, said carrier tube being thereby heated sufficiently to ignite the charge in said combustion chamber, a first plate extending across said primary combustion chamber but terminating short of the upper margin thereof, a second plate disposed in spaced parallel relation to said first plate and extending to the upper margin of said primary combustion chamber, elements spaced inwardly from the side margins of said first plate and spanning the space between said plates, said elements terminating short of the upper margin of said first plate, said plates and elements defining a generally vertical secondary chamber, means for introducing air into the space outboard of said elements, the flame exit end of said flame carrier tube communicating with the space between said plates, an aperture at the base of said second plate aligned with said flame carrier tube, said second plate being spaced from said refractory side wall to define therebetween a final combustion chamber communicating with said flue, the flame propagated through said carrier tube impinging on said refractory wall to raise it to incandescent temperature, whereby products of combustion are drawn by convection into said secondary chamber to be mixed with air moving across the upper margins of said elements, the aerated products of combustion moving through said secondary chamber to enter said final combustion chamber through said second plate aperture and flow through said final combustion chamber into said flue, the intersection of the flame and the aerated products of combustion at said second plate aperture and their movement along the incandescent refractory wall serving to consume smoke, odor-bearing vapors and particles entrained in the products of combustion.

3. In an incinerator of the type having a charge receiving primary combustion chamber and a flue for disposing of combustion gases, a flame carrier tube mounted to extend through the primary combustion chamber, means for introducing flame into one end of said carrier tube, the opposite end of said carrier tube being open to permit the exit of flame therefrom, said carrier tube being thereby heated sufficiently to ignite the charge in said combustion chamber, a first plate extending across said primary combustion chamber but terminating short of the upper margin thereof, a second plate disposed in spaced parallel relation to said first plate and extending to the upper margin of said primary combustion chamber, elements spaced inwardly from the side margins of said first plate and spanning the space between said plates, said elements terminating short of the upper margin of said first plate, said plates and elements defining a generally vertical secondary chamber, means for introducing air into the space outboard of said elements, the open end of said flame carrier tube communicating with the space between said plates, an aperture at the base of said second plate aligned with the open end of said flame carrier tube, means cooperating with said second plate to define a generally vertically extending final combustion chamber communicating with said flue, whereby products of combustion are drawn by convection across the upper margin of said first plate and into said secondary chamber to be mixed with air moving across the upper margins of said elements, the aerated products of combustion moving through said secondary chamber to enter said final combustion chamber through said second plate aperture and flow upwardly through said final combustion chamber into said flue, the intersection of the flame and the aerated products of combustion at said second plate aperture and their movement through said final combustion chamber serving to consume smoke, odor-bearing vapors and particles entrained in the products of combustion.

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