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L. T. KNIPE ET AL
GARBAGE INCINERATOR

2,698,587

Filed July 18, 1950

3 Sheets-Sheet 1

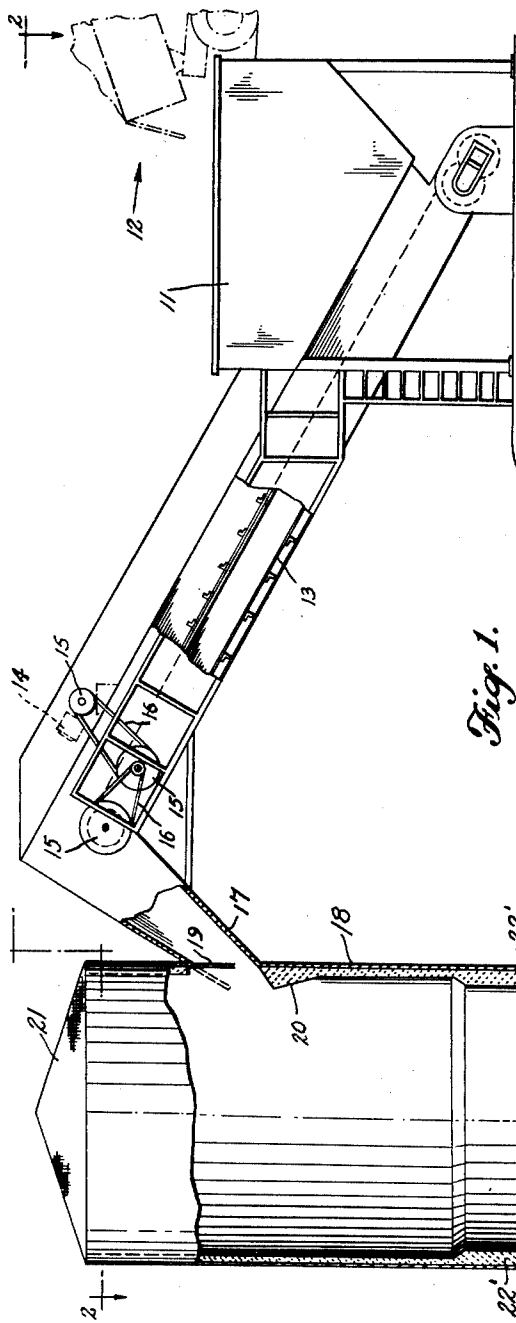


Fig. 1.

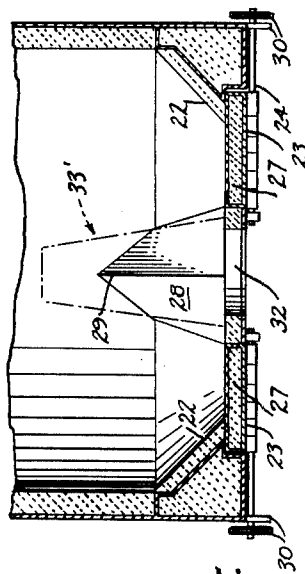


Fig. 5.

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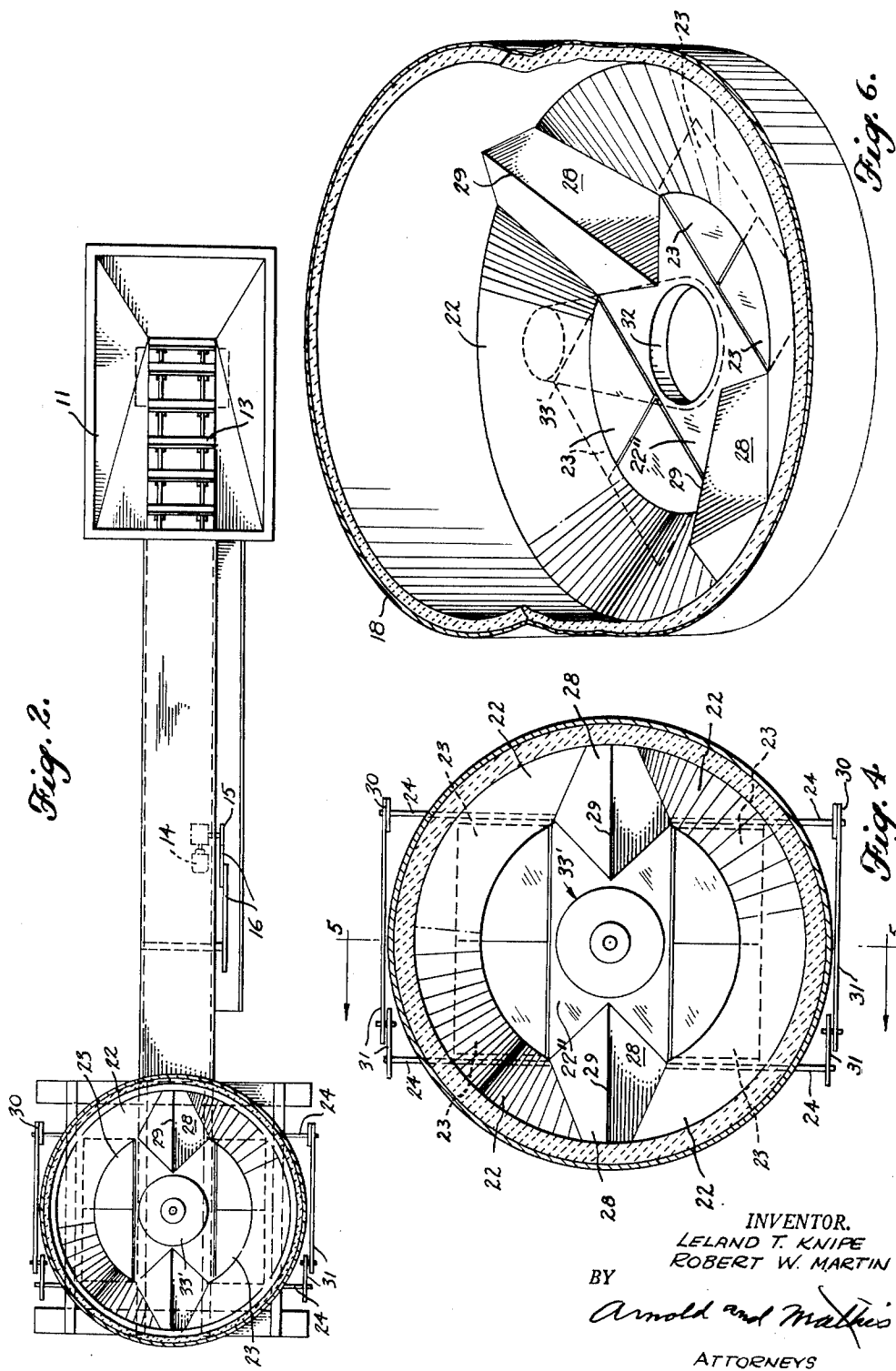
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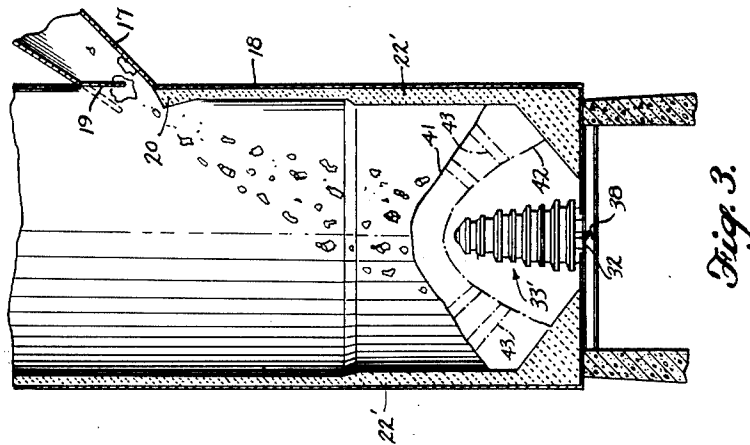


Fig. 3.

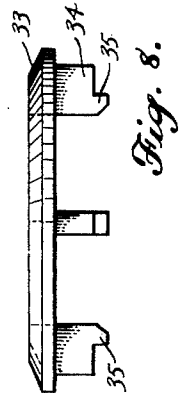


Fig. 8.

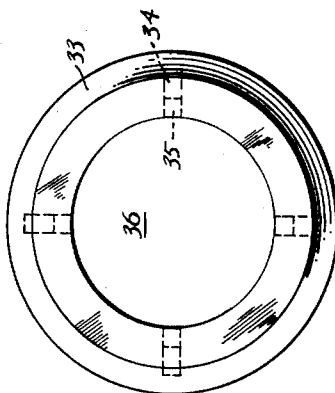


Fig. 9.

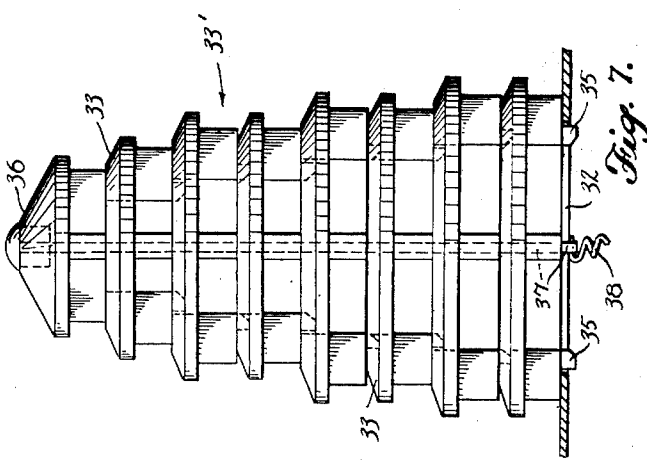


Fig. 7.

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GARBAGE INCINERATOR

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2 Claims. (Cl. 110—8)

Our invention relates to the incineration of garbage and apparatus for carrying out the same. More particularly, our invention relates to the incineration of unsegregated garbage without the use of oil burning apparatus or the like to complete the incineration.

In the incineration of unsegregated garbage, without the addition of oil or other combustibles, it is required that there be a burning of a heterogeneous mass which contains many non-combustibles, as tin cans, and the burning of much moisture laden material which is not readily combustible. Also, in unsegregated garbage there are very likely to be wood and paper boxes or cartons that are readily combustible. Also, in the incineration of unsegregated garbage, it is necessary that the garbage be burned or oxidized to the extent that the end product or ash be sufficiently oxidized so it will be sterile and not a source of attracting rodents, flies and other types of animal life and bacteria which feed on organic material.

Heretofore many attempts have been made to burn or incinerate garbage, but they have required segregation of the garbage and the addition of readily combustible materials as fuel oil.

It is an object of our invention to provide an incinerator for the burning of unsegregated garbage and burn the same without the addition of fuel oil or other combustibles during the incineration, and to obtain necessary heat for incineration from the combustible components in the garbage aggregate.

It is a further object of our invention to provide a garbage incinerator which has a low draft and at the same time sufficiently high temperatures so that smudge or smoke is reduced to a minimum. Obviously, any smudge or smoke arising from a garbage incinerator will have undesirable odors.

It is a further object of our invention to provide a desired type of bottom for our incinerator so that all of the ash will have its organic content completely oxidized so as to eliminate the possibility of a portion of the ash containing undesirable material as unoxidized organic material.

It is a further object of our invention to provide a garbage incinerator which will operate under conditions so that it will not constitute a nuisance and may be thus located in urban areas, thus reducing the haul or transportation of garbage from cities to remote garbage incinerators or dumps.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of the specification, with the understanding, however, that the invention is not to be limited to the exact details of construction shown and described since obvious modifications will occur to a person skilled in the art.

In the drawings,

Figure 1 is a somewhat schematic view in elevation, with parts broken away and with parts shown in section of a typical installation of devices embodying our invention;

Fig. 2 is a view in plan of some of the structure shown in Fig. 1, and with the screen on the top of the incinerator removed;

Fig. 3 is a fragmentary sectional view with parts shown in elevation of portions of the apparatus shown in Fig. 1

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to illustrate conditions which will exist during incineration of garbage in accordance with our invention;

Fig. 4 is a plan view of the bottom of an incinerator embodying our invention;

Fig. 5 is a sectional view taken substantially on broken line 5—5 of Fig. 4;

Fig. 6 is a fragmentary perspective view illustrating the bottom of an incinerator embodying our invention;

Fig. 7 is a detached elevational view of a burner grate combination which may be employed in our invention;

Fig. 8 is a view in elevation of one of the grates shown in Fig. 7; and

Fig. 9 is a plan view of the grate shown in Fig. 8.

Referring now to Fig. 1 of the drawings, any suitable pit 11 is provided, into which garbage may be dumped, as by dump truck 12, a fragment of which is shown toward the right in Fig. 1 of the drawings. Unsegregated garbage may be delivered from the truck 12, which may be either a truck with loose-filled garbage or with compressed garbage. It is common practice to deliver garbage for disposal in loose or packed form and our device will incinerate either or both. The pit 11 is provided with a conveyor 13 forming the floor thereof. The conveyor 13 may be driven by any usual means and preferably includes a variable speed drive. This may comprise variable speed motor 14, connected to any suitable source of power (not shown). Motor 14 connects with conveyor 13 through suitable reduction means as sheaves 15 and link belt means 16. Thus, upon rotation of motor 14 at a desired speed, the conveyor 13 is caused to travel and any garbage thereon will be delivered from the pit 11 and into discharge chute 17. Discharge chute 17 discharges into an upper portion of a cylindrical housing 18. Preferably, a hinged door 19 is suspendedly supported across chute 17 so as to normally minimize the size of the opening between chute 17 and cylindrical housing 18. Thus, the door 19 will have its bottom portion sufficiently high above the bottom of chute 17 so that most pieces of garbage will slide downwardly on the floor of chute 17 and the door 19 will remain in its normal suspended vertical position. However, in case of extra-large size pieces, they will cause the door 19 to swing inwardly, as indicated by the dotted line position in Fig. 1, so that the garbage will pass out of the chute 17 and into the incinerator which includes the cylindrical housing 18. A fillet 20 is preferably provided on the inside of the cylindrical housing 18 so as to deflect and divert gases of combustion arising therepast so that said gases pass upwardly of the housing 18 and out through screen 21 rather than into the chute 17. Also, the incline of the chute 17 is such so as to direct garbage centrally of housing 18 at the burning level, which is illustrated in Fig. 3.

It is desirable, in burning garbage, to provide for a limited draft so that the gaseous products of combustion arise slowly in the incinerator for most complete combustion, and thus preferably the housing 18 has substantially the same diameter throughout its height and is relatively wide compared to its height. In other words, a slow velocity in the rising gases is desired so that the gases and particles will have an opportunity to be substantially oxidized as they rise upwardly and before they pass screen 21, and this for the purpose of reducing odors and flying ash to a minimum.

The cylindrical housing 18 is lined with suitable refractory material 22' about its periphery. As an example, but not as a limitation of a successful device embodying our invention, the cylindrical housing 18 may have a diameter of about fifteen feet and a height of about thirty-two feet.

The floor for the cylindrical housing 18 preferably comprises an inverted frusto-conical bottom portion 22. The angular relationship of said bottom portions 22 to the horizontal or flat portions 22' may be in the nature of 45°. Also, doors 23 are hingedly connected as by shafts 24 with the bottom of the housing 18.

Referring to Fig. 5 of the drawings, the doors 23 underlie the opening in the frusto-conical bottom portions 22. In other words, when the doors 23 are closed, we have a saucer-like bottom with a central opening and a lip formed by portion 22. The doors 23 are preferably

formed from upper and lower metallic surfaces separated by refractory material 27 disposed therebetween. The bottom portions 22 are preferably formed of heat refractory material.

In order to facilitate gravity discharge of ash toward doors 23, guides 28 which have their apexes 29 raised above the level of the bottom portions 22 are provided, and thus ash will slide either way from the apexes 29 and toward one of the doors 23.

Each door 23 is hinged on an angularly movable shaft 24 (Figs. 4 and 5), as previously described, and said shafts 24 may be suitably operated, as fragmentarily illustrated, by sheaves 30 and link belts 31.

The bottom of our incinerator is provided with an opening indicated by 32 in Figs. 3, 5 and 6 of the drawings. Over the opening 32 is provided a grate generally numbered 33' in Figs. 1 to 6, inc., the details of which appear in Figs. 7 to 9 of the drawings.

While many types of grates may be successfully employed in connection with our invention, such as that illustrated in the patent to Poor, No. 2,412,694, we have found best results with the type of grate shown in Figs. 7 to 9 inc., and particularly in combination with the shape of floor above described. Such grate is relatively not clogible in actual use and comprises a plurality of ring like sections, preferably disposed in superposed step-like construction as shown and with the rings at the bottom in pairs. Each ring comprises an annular ring portion 33 having four spaced legs 34 thus providing for passageways below each ring 33 and between spaced legs 34. The spaced legs 34 are preferably provided with foot portions 35 so that said foot portions 35 of a given ring will fit into the opening of an annular ring 33 positioned below any given ring. The foot portions 35 of a bottom ring (such as the ring shown at the bottom in Fig. 7) will interfit with and prevent lateral displacement of a ring resting on an opening 32 in the bottom of the incinerator. Enough tolerance is provided between the foot portions 35 and the floor therebelow or the ring therebelow to allow for expansion and contraction due to temperature conditions which may exist. However, during burning conditions and where temperatures in the neighborhood of around 1700° F. are encountered in the hottest area, the grate 33' is generally at relatively cool temperatures and can be touched by one's hand.

The top ring 33 is covered by a suitable cap member 36, and said cap member 36 is provided so that garbage cannot directly fall downwardly into the opening 32 (see Fig. 7) which is substantially centrally throughout the grate and up through which air for combustion passes. Also preferably a connector member 37 (see Fig. 7) is secured to the cap 36 and extends downwardly through the opening 32 in the various rings and is connected with a spring 38. Spring 38 is connected in any suitable manner (not shown) to the base of the incinerator so that a resilient pressure is provided urging the cap 36 and rings 33 toward each other and toward the bottom of the incinerator around opening 32 to prevent accidental displacement as garbage is delivered into the incinerator.

Preferably the incinerator comprising cylindrical housing 18 is disposed at an elevation so that trucks can be positioned directly under the doors 25 for gravity discharge of the ash into such a truck, illustrated by 39 in Fig. 1. This will require suitable incinerator and truck supporting means 40. Also, we have illustrated suitable elevations of the pit or hopper 11 relative to the cylindrical housing 18 and support 40 obtained by the contour of the ground in Fig. 1 of the drawings.

In the operation of our invention, garbage is delivered into the incinerator and to substantially the level indicated by the line 41 in Fig. 3. Thereafter, suitable material, such as cellulose fiber dipped in kerosene, is inserted up through the grate and into some of the openings between the spaced legs 34. Thereafter, such inflammable material is ignited and, after a relatively short period in most instances, the garbage around the grate 33' becomes ignited and such fire tends to burn the garbage to the level indicated by line 42 in Fig. 3 of the drawings, and then the smoke and fire tend to channel through the garbage, as is indicated by the passageways 43 in Fig. 3. As soon as a suitable fire is started, then garbage in regulated amounts is delivered down chute 17 and the amount of garbage is regulated to maintain the level 41.

By maintaining the garbage to a level to that approxi-

mately illustrated by the line 41 in Fig. 3, we have a blanket over the fire and with the fire channeling out through the garbage to discharge the gaseous products of combustion. However, a temperature is maintained sufficiently hot at an area slightly removed from the burner and indicated by the line 42 in Fig. 3 so that temperatures in the neighborhood of over 1700° F. are generally encountered. This temperature was determined by pyrometer readings and by the fact that glass bottles and the like in garbage were fused and melted. Also, in typical installations embodying our invention, it has been found that light gauge tin cans are melted and that even heavier gauge tin cans are sufficiently oxidized so that they readily deteriorate upon removal from the incinerator.

In garbage incineration, it is not only desirable to reduce the bulk of the original garbage as compared to the ash, but it is highly desirable to oxidize organic material in the garbage. In incinerators involving our invention, we have been able to reduce the bulk so that the residue ash is less than 10% of the original volume and less than three percent of the original weight. Also, we have been able to sufficiently oxidize unsegregated garbage to such an extent that the organic content is so low that the ash is substantially sterile so far as sustaining flies or rodents or other undesirable life or bacteria.

Next, in the operation of devices embodying our invention, the velocity of discharge of the gases is reduced to a minimum so that combustible gases are allowed to remain in the incinerator for a sufficient time so as to substantially burn combustibles initially remaining in the discharging gases. Also, due to our apparatus and the method of feeding the fire, relatively low temperatures exist around the grate 33' and thus provide for prolonged life of grates. Also, by operation of our invention in the manner described, temperatures are relatively high in the zone adjacent but not contiguous with the grate 33'. Thus, we find that the ash produced in our incinerator burns very cleanly in the neighborhood of the floor. We have found that the particular shape of our floor tends to cause very clean and complete burning in the neighborhood of the floor area. Most unsegregated garbage tends to intertwine and form an intertangled mass which is generally self-supporting. Apparently this accounts for the reason for the burning away of the garbage contiguous with the grate 33' and thus during burning the garbage is generally self-supporting so that the burning area is adjacent the line 42 in Fig. 3 of the drawings and thus until the garbage is reduced to a substantially completely combusted state, it does not tend to fall down to the floor but maintains the burning zone above described.

In our invention we employ the garbage about the burning zone as a blanket to maintain relatively high and intense heat in the burning zone, and furthermore, said garbage works as a heat insulating material and reduces the temperature adjacent the side walls of the incinerator; furthermore, the air passing through the grate to support combustion is at substantially one atmosphere pressure and not only tends to keep the grate cool but becomes warm because of contact with the previously burned material about the grate and thus heated air is furnished which tends to accelerate combustion. The air should be introduced throughout the burning zone, and thus as an illustration, if the cylindrical housing 18 has a diameter of fifteen feet and a height of thirty-two feet, then the grate 33' may have an overall height of five and one-half feet. This provides for the introduction of air at substantially atmospheric pressure throughout the combustion zone.

In a general way, we provide a construction and method where the garbage provides for not only insulating the side walls of cylindrical housing 18 but serves as a blanket to maintain a temperature zone of intense heat substantially centrally of the garbage. The high or elongated cylindrical housing 18 provides for low velocity of the ascending gases of combustion, and thus eliminates fly ash and provides for a maximum combustion of the discharging gases and particles carried thereby.

Obviously, changes may be made in the form, dimensions and arrangement of the parts of our invention, without departing from the principle thereof, the above setting forth only a preferred form of embodiment.

We claim:

1. A garbage incinerator comprising a relatively high tubular member of substantially uniform diameter

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throughout its height and being open at the top thereof over its entire diameter, a floor disposed across the interior of the lower end of said tubular member and forming the bottom of a combustion chamber, said floor being partially flat and partially of an inverted frusto-conical design with the peripheral portions thereof being inclined inwardly and downwardly of the tubular member to the horizontal flat portion of the floor, the flat portion of the floor being provided with a substantially centrally disposed aperture and discharge openings on each side of said centrally disposed aperture, said aperture communicating directly with the atmosphere, a vertically disposed hollow grate having laterally directed air feeding openings mounted on the flat portion of the floor directly over the centrally disposed aperture, said grate having a height which is a plurality of times greater than its diameter, and the height thereof being a plurality of times less than the height of said tubular member, and discharge gate means movable into and out of substantially complete closing position relative to said discharge openings in said floor.

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2. The combination of claim 1, wherein guide means are provided on the floor member and between said discharge openings to direct ash toward said discharge openings.

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