

Aug. 6, 1968

L. M. FORD ET AL

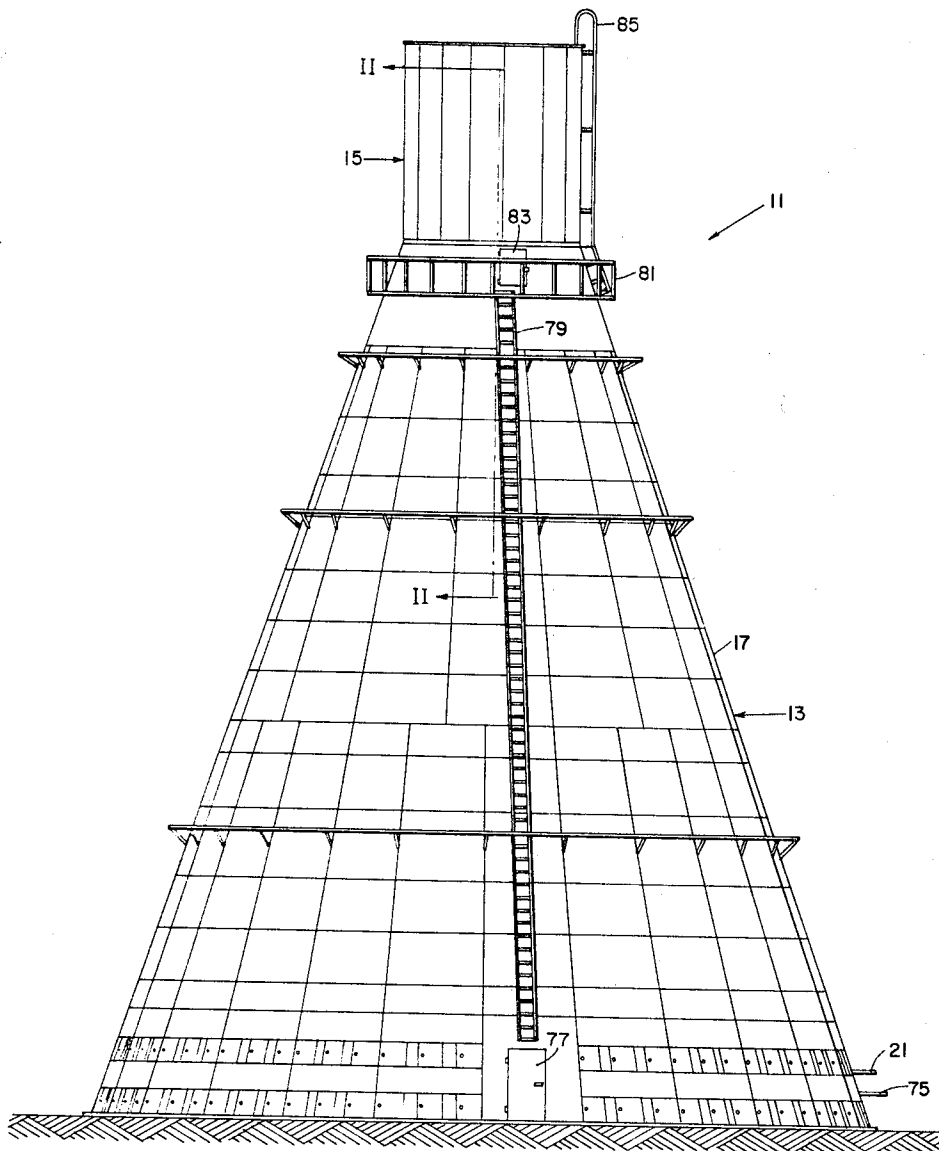
3,395,656

FLYASH REMOVAL DEVICE FOR INCINERATORS

Filed Jan. 30, 1967

2 Sheets-Sheet 1

FIG. 1



INVENTORS,
LEWIS M. FORD
DAVID M. FRANKLIN

BY
Weatherford & Weatherford
Attys

Aug. 6, 1968

L. M. FORD ET AL

3,395,656

FLYASH REMOVAL DEVICE FOR INCINERATORS

Filed Jan. 30, 1967

2 Sheets-Sheet 2

FIG. 2

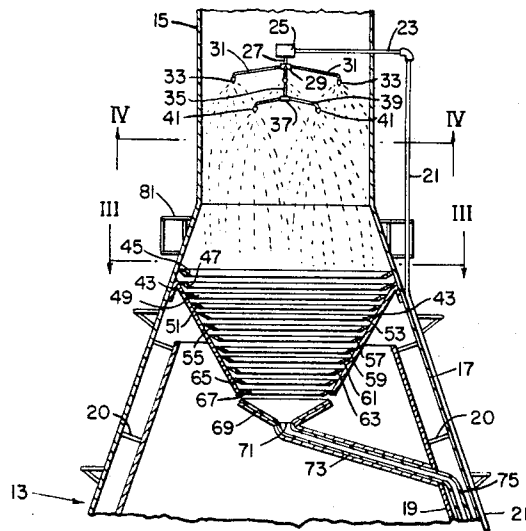


FIG. 3

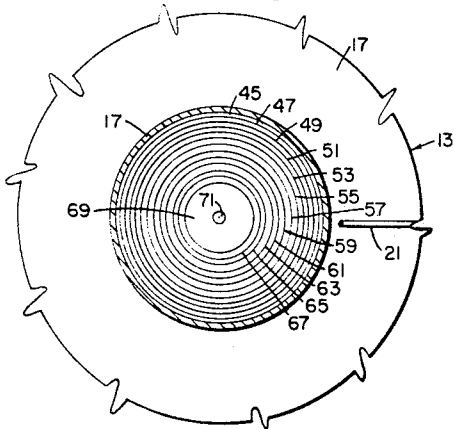
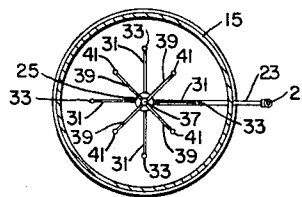


FIG. 4



INVENTORS,
LEWIS M. FORD
DAVID M. FRANKLIN

BY *Weatherford & Weatherford*
attys

1

3,395,656

FLYASH REMOVAL DEVICE FOR INCINERATORS
Lewis M. Ford and David M. Franklin, Memphis, Tenn.,
assignors to Steelcraft Corporation, Memphis Tenn., a
corporation of Tennessee

Filed Jan. 30, 1967, Ser. No. 612,463

4 Claims. (Cl. 110—18)

ABSTRACT OF THE DISCLOSURE

An apparatus consisting of spray nozzle means for removing flyash and other solid particles from incinerator smoke, wetting the solid particles with water allowing them to return below the incinerator passing a number of concentric louvers, through a catch basin, the catch basin having drain means to carry the wetted matter away from the incinerator.

BACKGROUND OF THE INVENTION

Field of the invention

The embodiment of the present invention pertains to new and useful improvements in the removal of solid matter in the form of free particles from the smoke, or vapor by-product, formed as a result of the combustion of materials in a combustion chambered device such as an incinerator, and more particularly to the prevention of the emission of the flyash formed by combustion, from the incinerator. The invention further provides means for substantially saturating the minute solid particles of matter produced by the combustion in the burner or incinerator, to increase the weight of the minute particles until the particles become heavier than the surrounding air in the combustion gases and are moved gravitationally downwardly toward the burner where they may be trapped in a suitable catch basin and transported therefrom through suitable drain means away from the combustion chamber and the burner or incinerator.

Description of the prior art

Although there have been numerous burners and incinerators in prior use, there has been none that has satisfactorily provided for the efficient and successful removal of particles of solid matter and similar substances capable of remaining ignited beyond the incinerator, increasing the probability and danger of transmitting combustible materials to other structures in the vicinity of the incinerator. The present invention employs the use of water delivered either from a sump or from an outside source, not shown, for vaporization or spraying, to impinge upon and substantially increase the weight of the free particles in the flue gases allowing the saturated particles to drop more rapidly downwardly into the catch basin and therebeyond away from the incinerator.

The present invention provides means for transporting the liquid used for wetting the free particles and other combustion by-products carried by the smoke and flue gases away from the firebox or combustion chamber of the incinerator.

Additionally, the sprayed liquid is directed downwardly inwardly toward the axial center of the incinerator by means of a funnel means consisting preferably of truncated louvers and thence through a catch basin and drain means.

A search of the prior art disclosed the following references: 2,646,263 (M. W. Goldberg) July 21, 1953; 2,978,998 (S. D. Frankland) Apr. 11, 1961; 3,137,253 (A. W. Clayton) June 16, 1964; 2,584,404 (E. C. Webb) Feb. 5, 1962; 1,622,431 (J. Feigenbaum) Mar. 29, 1927;

2

2,597,192 (C. B. Schneible) May 20, 1952; 2,910,020 (T. E. Winkler) Oct. 27, 1959.

Summary of the invention

The present invention provides an improvement in the removal of flyash and other solid matter from the gases emitted during combustion in incinerators and similar burning devices, wherein the improvement comprises spray means preferably of a plurality suspended in the flue above the incinerator dome but below the emission point substantially in the path of the upwardly escaping flue gases to moisten the flyash and other particles carried by these flue gases and direct the heavier saturated particles downwardly toward a funnel means preferably comprising a series of concentric spaced louvers, preferably arranged in series of successively downwardly reducing louvers forming in effect a downwardly tapering inverted cone-like structure of the louvers, into a catch basin and therefrom through drain means away from the incinerator, the flyash and particles being substantially entrained with the liquid for such discharge.

Objects

The principal object of the present invention is to provide means for the removal of flyash and other solid matter from the smoke and flue gases formed by combustion in an incinerator or similar burning device.

Another object of the present invention is to provide funnel louver means for incinerators to direct the descending flyash and wetted solid matter away from the ascending smoke path produced by the combustion within the incinerator.

A further object of the present invention is to provide a catch basin and drain means for incinerators to accumulate and transport flyash and other solid materials externally of the incinerator combustion chamber.

Another object of the present invention is to provide an incinerating device with spaced apart concentric louvers contained therein to permit the wetted flyash and other solid particles to pass downwardly across the inner surfaces thereof, and the smoke gases and products of combustion to pass upwardly through the spaces therebetween; and

Another object of the present invention is to improve the design, construction and efficiency of incinerators and similar burner devices.

Description of drawings

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will be readily understood from the following specification upon reference to the accompanying drawings, in which:

FIG. 1 is a front elevational view of an incinerator incorporating the device of the present invention.

FIG. 2 is a fragmentary vertical cross sectional view of the device of FIG. 1 as taken on the line II—II of FIG. 1.

FIG. 3 is a fragmentary transverse cross-sectional view of the device of FIG. 1 as taken on the line III—III of FIG. 2; and

FIG. 4 is a transverse cross-sectional view of the device of FIG. 1 as taken on the line IV—IV of FIG. 2.

Description of the preferred embodiment

Referring now to the accompanying drawings in which the various parts are indicated by numerals, the embodiment of the present invention comprises an incinerator or like burner device **11**, provided with a conically shaped combustion chamber **13** and a substantially cylindrical chimney or flue **15** attached to the uppermost portion of the combustion chamber **13** and extending upwardly

3

therefrom. The combustion chamber 13 comprises preferably a conical outer skin portion 17 and an inner substantially heat-retaining liner 19 spaced somewhat inwardly of the outer skin 17 and in substantially conical alignment therewith. The combustion chamber 13 additionally comprises a plurality of randomly spaced rods 20 interposed between the outer skin 17 and the inner liner 19 in perpendicular relation to the outer skin 17 and the inner liner 19 maintaining the substantially parallel spaced apart relation between skin 17 and liner 19, to provide a substantial insulating layer of air between the inner liner 19 and the outer skin 17 reducing the transference of heat from the inner liner 19 to the outer skin 17.

The device is further provided with a water pipe 21, attached to a source of water under pressure (not shown) extending upwardly externally of and along the combustion chamber 13 and the attached cylindrical flue 15. The pipe 21 connects the water supply into the present device and, for purposes of illustration here, is provided at its uppermost end with a substantially perpendicularly disposed leg 23 extending inwardly of the cylindrical flue 15 and terminating at a suitable connector 25 positioned preferably substantially on the vertical axis of the cylindrical flue 15. A pipe 27, affixed to the connector 25 and communicating with pipes 21, 23, is shown depending downwardly into threaded engagement with a distributor 29 spaced somewhat below the connector 25. Distributor 29 is shown as preferably provided with a plurality of radially outwardly extending, angularly downwardly disposed tubular hollow arms 31 having a like plurality of nozzles 33 attached to the distal ends thereof, all thus communicating with the water supply from pipe 21. It will be appreciated that in some constructions the nozzle means need only comprise a single nozzle which may be connected as desired to the liquid supply. The device of the present invention as shown further comprises pipe means 35 attached in flow communication to distributor 29 below arms 31, extending substantially vertically downwardly from distributor 29, and having attached to its distal extremity a disc-like fitting 37 provided with a plurality of radially outwardly, angularly downwardly disposed tubes 39. The tubes 39 are provided with supplemental nozzles 41 attached to the outer ends thereof disposed in intermediate spaced relation offset from the disposition of the nozzles 33. It will be understood that the supplemental nozzles may be omitted or may be limited to one nozzle means.

The combustion chamber 13 is provided internally in its upper throat portion with a series of angularly deformed bracket members 43 attached as by welding or similar means to the inner surface of the outer skin 17 depending inwardly toward the vertical axis of the combustion chamber 13. The brackets 43 are adapted to support a plurality of truncated frusto-conical louvers in concentric arrangement to form a substantially funnel shaped configuration. The uppermost louver 45 is attached to the inner surface of the outer skin 17 and is positioned to direct the falling moisture-laden ash and other particles peripherally inwardly and downwardly to the subjacent spaced frusto-conical louver 47 attached to the upper ends of the brackets 43. It will thus be readily seen that the descendingly layered concentric frusto-conical louvers 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, arranged in the aforementioned funnel shaped configuration will direct moisture laden material downwardly toward the vertical axis of the combustion chamber 13, to the catch basin 69 spaced below the louver 67 to accumulate the droplets of liquid and the matter carried thereby, and allow the warmer lighter than air smoke to pass upwardly through the spaces between the louvers 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, the spaces in effect providing slots between the louvers so as to create a slotted funnel.

The catch basin 69 is substantially conical and is provided with egress means 71 at its inverted apex to direct the wetted ash and other matter accumulated therein

4

downwardly external the catch basin 69 into the attached angularly disposed drain pipe 73. The drain pipe 73 extends through and is supported by a snugly embracing aperture in the inner liner 19 of the combustion chamber 13, and is attached to a drain downspout stand pipe 75 interposed between the outer skin 17 and the inner liner 19 of the combustion chamber. The drain downspout stand pipe 75 is provided for carrying the wetted flyash and other moisture laden material away from the incinerator 11 to a suitable sump means not shown.

The present invention is further provided with an entry door 77 mounted on the periphery of the base of the combustion chamber 13 for access to the combustion chamber, ladder means 79 extending substantially vertically upwardly from the door 77 and attached to the outer skin 17 of the combustion chamber 13, a substantially circular catwalk 81 affixed to the upper end of the combustion chamber 13 somewhat below the junction of the combustion chamber and the flue 15, an upper door 83 for access to the louvers contained in the upper portion of the combustion chamber 13, and a ladder 85 extending upwardly from the catwalk 81 to the top of the flue 15.

It will thus be readily seen upon reference to the drawings, and more particularly to FIGS. 2 and 3 of the drawings, that in the use of the device of the present invention the smoke and other vaporous by-products of the combustion in the combustion chamber 13, being heated and lighter in weight than the surrounding atmosphere, rise upwardly from the combustion chamber into the cylindrical flue 15. A non-combustible liquid under pressure is carried by the pipes 21 and 23 to the distributor 29 to the nozzles 33 and through the hollow disc 37 to the nozzles 41. The nozzles 33, 41 eject the liquid therefrom into the cylindrical flue 15 in separated spray droplets such as fog or mist to which the ash and solid matter in the rising smoke is attracted. The spray droplets containing entrained flyash and other minute particles are directed gravitationally downwardly into contact with the inner surfaces of the louvers 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, and into the catch basin 69. The insulation around the catch basin 69 and the drain means 73 prevent the liquid from heating and vaporizing and further allow the entrained flyash carrying liquid to be transported rapidly away from the combustion chamber to a sump or reservoir.

It is apparent that the funnel like structure preferably formed of the louver rings may be otherwise formed and that the slots may be otherwise formed in such funnel and may be circumferentially continuous or may be discontinuous.

We claim:

1. Means for removing flyash and minute particles from the products of combustion of an incinerating device having a combustion chamber surrounded by an outer skin and a flue mounted upon the upper end of said combustion chamber, said means comprising

(A) means for supplying noncombustible liquid under pressure to an upper part of said flue,

(B) means for delivering said liquid, so supplied, within said flue including

(1) liquid spraying nozzle means communicated to said supplying means comprising a plurality of nozzles,

(2) said nozzle means being downwardly directed within said flue including

pingue upon and wet said flyash and minute particles in said products of combustion within said flue, so as substantially to entrain said flyash and minute particles with said discharged liquid,

(3) said nozzle means comprising a pair of series of nozzles, one said series of nozzles being positioned vertically away from the other of said

5

series, the nozzles of each said series being horizontally circumferentially spaced apart,
 (C) receiving means for receiving said discharged liquid and flyash and minute particles from the products of combustion entrained therewith and delivering said discharged liquid and entrained flyash and particles away from said combustion chamber, including

(1) downwardly open funnel means supported in said combustion chamber adjacent to and below the area of liquid discharge from said nozzles in said flue, for guiding said discharged liquid and entrained particles and flyash downwardly from said flue,

(2) basin means disposed below said funnel means to accumulate said liquid and entrained matter, deposited from the lower end of said funnel means.

(3) drain means communicating into said basin means for draining accumulations from said basin means, said drain means including downspout pipe means extending externally beyond said combustion chamber.

6

2. Means in accordance with claim 1, in which the horizontal spacing of one series of nozzles is laterally offset from the horizontal spacing of the nozzles of the other series.

3. Means in accordance with claim 1, in which said nozzles are respectively radially spaced away from the vertical axis of said flue.

4. Means in accordance with claim 1, wherein said combustion chamber includes an inner liner within said outer skin and said drain means includes a downspout stand pipe interposed between said inner liner and said outer skin to substantially maintain said liquid and the flyash and particles entrained therewith discharging through said drain means at a temperature below the level of evaporation of said liquid.

References Cited

UNITED STATES PATENTS

2,108,248	2/1938	Bichowsky	-----	55—233 X
2,869,487	1/1959	Sherman.		
2,978,998	4/1961	Frankland	-----	110—18

JAMES W. WESTHAVER, *Primary Examiner.*