METHOD AND APPARATUS FOR SEPARATING CHIMNEY ASH

Fig. 1

Fig. 2

Inventors

JOSIAH B. KING
ROBERT W. KING

by

HERMON M. MANN, EARL A. BIGGERS
METHOD AND APPARATUS FOR SEPARATING CHIMNEY ASH

Joseph B. King and Robert W. King, Chicago, Ill.
Application September 8, 1954, Serial No. 454,784
1 Claim. (Cl. 183—34)

This invention relates to apparatus designed to be employed in connection with chimneys to prevent the discharge of fly ash and other particles therefrom.

Where chimneys or stacks are connected to incinerators, paper and similar substances burned in the incinerator frequently produce a resultant formation of light, flake-like particles known as fly ash. These particles are carried upwardly by the chimney draft and, after being discharged from the chimney, settle on surrounding objects which is, of course, objectionable.

Efforts have been made in the past to prevent this objectionable discharge by the use of screens or the like in the path of flow of gases up the chimney, but such systems have not been entirely satisfactory due to the possibility of clogging the screen by flat pieces of ash.

It is therefore an important object of the present invention to provide a novel and improved method and apparatus for separating fly ash from chimney gases which avoids the danger of clogging the chimney.

It is a further important object of the present invention to provide a method and apparatus relying on an abrupt change of direction to settle relatively large ash from chimney gases and relying on a dead air chamber for separating lighter ash.

It is another important object of the present invention to provide a novel settling structure for separating relatively large ash from chimney gases traveling up a chimney.

It is still another object of the present invention to accomplish the desired results by a simple and inexpensive structure which is slightly in appearance and which may readily be applied to existing incinerator and similar chimneys.

Other and further important objects of this invention will be apparent from the following specification and accompanying drawings.

The invention (in a preferred form) is shown on the drawings hereinafter more fully described.

On the drawings:

- Figure 1 is a somewhat diagrammatic perspective view showing the portion of an incinerator chimney extending above the roof of a building with an embodiment of the present invention operatively associated therewith and with one wall of a lower ash removal housing removed to show the interior parts;

- Figure 2 is a longitudinal vertical sectional view through the upper ash removal housing of Figure 1.

As shown on the drawings:

- Reference numeral 10 designates a chimney or stack extending above the roof 11 of a building employing an incinerator or other source of combustion products which are discharged into the usual longitudinal passage 14 through the chimney.

In accordance with the present invention, a tortuous path is interposed along the longitudinal passage 14 through the chimney and the chimney gases are diverted into this tortuous path and thereby subjected to an abrupt change of direction to separate relatively heavy ash from the gases. In the drawings we have chosen to show this tortuous path as positioned above the roof 11 of the building since this is ordinarily a convenient location, but it is to be understood that the tortuous path may operate satisfactorily if connected to the chimney or stack 10 anywhere above the point at which the incinerator discharges products of combustion thereinto.

The tortuous path is provided by means of a housing 15 which may be constructed from any suitable noncombustible material, such, for example, as sheet metal, fireproof composition board, or the like. Said housing 15 embodies a roof or top wall 15a, side walls 15b (one of which has been omitted in Figure 1 to show the interior of the housing), a floor or bottom wall 15d and an end wall 15f. These walls are assembled and held together by any suitable framing means such for example as angle irons. It will be noted that said housing 15 is provided with only one end wall so that it has one open end which in the accompanying drawing is shown at the left hand side of the housing. The open end of the housing communicates with a lateral opening into the longitudinal passage 14 through the chimney 10, a baffle 18 being provided to close off the longitudinal passage so that the top portion of the housing communicates with the longitudinal passage through the chimney or stack above the baffle 18 while the bottom portion of the heat location, but it is to be understood that the tortuous path may operate satisfactorily if connected to the chimney or stack 10 anywhere above the point at which the incinerator discharges products of combustion thereinto.

To provide a tortuous path for flow of gaseous products of combustion through the housing 15, a generally horizontal baffle means 19 is provided which extends from the top portion of the baffle 18 laterally into the housing intermediate the top and bottom portion thereof and to a point spaced from the end wall 15f. By virtue of this arrangement, an abrupt change of direction is provided for the flow of gaseous products of combustion through the housing 15 as indicated by the arrows 20. It will be observed that a damper 22 is pivotally mounted by a rod 23 having an operating handle 24 exteriorly of the housing for controlling the flow path out of said housing. A baffle 26 pivotally mounted by a rod 27 and having an operating handle 28 is disposed in the lower portion of the housing below the inner end of baffle 19 to leave an aperture 30 thereabove for flow of chimney gases therethrough as indicated by the arrows 29. The housing end wall 15f is provided with a door 32 which affords access to the interior of the housing in which the fly ash and similar material has collected. The damper 22 is normally in an open condition, being closed only for cleaning.

It will be observed that the housing 15 provides a flow path of unimpeded cross-section relatively large in comparison to the size of ash normally encountered in the chimney and avoids the use of screens or the like which may be subject to clogging. Thus the relatively large ash particles are settled out in the housing 15 without any danger of clogging the flow path up the chimney.

For settling out the relatively light ash the chimney is provided at the upper end thereof above the housing 15 with a casing 40 having a flue extension 41 extending thereinto to form a dead air chamber indicated at 42. The casing carries a spark arrester screen 43 which may for example be one quarter inch mesh and which defines with the casing 40 an expansion chamber 44 above the end of the flue extension 41. Thus gases flowing through the chimney 10 and out through the flue extension 41 will be discharged into chamber 44 of substantially larger area than the flue, whereupon the velocity and pressure of the gases are substantially decreased. This expansion of gases into a larger area will cause a substantial reduction in pressure particularly in the region indicated at 45 surrounding the discharge end of the flue extension, and this reduction in pressure will permit relatively lighter
particles of fly ash which are carried through the housing 15 to drop into the chamber 42 formed between the outer walls of the flue extension 41 and the inner walls of the casing 40. Even though a certain amount of this lighter fly ash may be carried up against the inner side of the screen 43, the pressure and velocity of gases emanating from the flue extension 41 has been so much decreased that this fly ash will not be pulverized and upon any diminution of the draft will drop back into the chamber 42.

Further, when there is a cross wind blowing across the open end of the casing 40, it will tend to cause a turbulence of air within the casing above the discharge end of the flue extension 41, thus neutralizing any tendency of an increased draft which ordinarily results from such a cross wind.

It is to be noted that the lower end of the chamber 42 formed between the flue extension 41 and the casing 40 is normally kept closed so as to form a dead air chamber into which the lighter fly ash may readily drop. Access to the interior of this chamber is conveniently provided by doors such as indicated at 46 in Figure 1 in the walls of the casing 40 near the bottom thereof to permit the taking out of fly ash and other material deposited within the chamber 42.

It will be understood that as the gaseous stream enters the lower part of the housing 15, the larger ash flakes will tend to strike the vertically disposed damper baffle 26 and that these larger flakes will tend to settle in the area between the chimney and the vertical baffle 26. In removing ash from the interior of housing 15, the vertical baffle 26 may be moved by means of the operating handle 28 to provide access to any ashes which have collected in this area.

It will be apparent from the foregoing that by this invention we have provided a simple two-stage method of separating fly ash from the gases flowing up a chimney, and that the invention may be carried out by a simple and inexpensive apparatus which may readily be applied to existing incinerator chimneys or as a part of newly constructed chimneys and which prevents or minimizes the discharge of fly ash into the atmosphere surrounding the chimney.

We are aware that details of construction may be varied without departing from the principles of this invention and we, therefore, do not propose limiting the patent granted hereon otherwise than necessitated by the scope of the appended claim.

We claim as our invention:

An incinerator separator system comprising in combination a chimney extension for mounting at the top of a chimney to receive gases flowing upwardly from said chimney, said chimney extension including a flue extension of substantial length extending upwardly from the flue of the chimney and receiving gases from the chimney flue, said flue extension having a top discharge opening substantially above the top of the chimney, said chimney extension further including a casing for mounting at the top of a chimney and surrounding said flue extension and extending thereabove and of cross section substantially greater than the cross section of the flue extension to provide an expansion chamber at the level just above the top discharge opening of said flue extension for receiving gases discharged from said flue extension, and a dead air chamber between said flue extension and said casing and below said expansion chamber for receiving ash which falls from said expansion chamber, and a housing below said chimney extension for disposition laterally of the path of travel of gases in a chimney and having a lower inlet lateral opening in a side thereof for receiving gases from a lower extent of the flue in the chimney below said inlet opening and having an upper outlet opening in said side thereof for communication with an upper extent of the chimney flue above said outlet opening and for communication with said chimney extension at the top of the upper extent of the flue, said housing having a horizontal baffle therein at a level between said inlet and outlet openings, said housing having a first unimpeded passage of cross section large in comparison with the ash carried by the chimney gases leading from said lateral inlet opening through said housing at a level below said horizontal baffle and leading beyond the edge of said baffle remote from said inlet opening, said housing having a chamber for relatively large ash below and in communication with said first unimpeded passage for receiving relatively large ash settling out of said first unimpeded passage, a second unimpeded passage of cross section large in comparison with the ash carried by the chimney gases in unimpeded communication with said first passage at the remote edge of said baffle and leading through said housing at a level above said baffle to said outlet opening, said first and second passages constituting a tortuous path of unimpeded cross section large in comparison to the ash carried by the gases in the chimney and said tortuous path facilitating settling of large ash in said chamber without danger of impeding flow of gases between said inlet and outlet openings, said chimney extension being operative to collect smaller ash not settled by said tortuous path, whereby both large and small size ash are removed from the gases without any danger of impeding the flow of said gases through said system.

References Cited in the file of this patent

UNITED STATES PATENTS

132,877 Thornton et al.  Nov. 5, 1872
640,796 Neibs  Jan. 9, 1900
787,631 O’Quinn  Apr. 18, 1905
1,270,147 Golling  June 18, 1918
1,438,611 Ryerson  Dec. 12, 1922
1,772,718 Howle  Aug. 12, 1930
1,996,608 Beck  Apr. 2, 1935
2,100,189 Lasch  Nov. 23, 1937
2,171,798 King et al.  Sept. 5, 1939
2,246,349 Crum  June 17, 1941