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71 Applicant: **J. McIntyre (Machinery) Limited**
Harrimans Lane
Dunkirk Nottingham NG7 2SD (GB)

72 Inventor: **Bramley, Alan Geoffrey**
c/o J. McIntyre Limited Harrimans Lane
Dunkirk Nottingham NG7 2SD (GB)

74 Representative: **Goodman, Christopher et al**
Eric Potter & Clarkson 14 Oxford Street
Nottingham NG1 5BP (GB)

54 **Afterburners.**

57 Exhaust gases within an afterburner are constrained to flow in a spiral manner in a predetermined direction dependent on the position of the chimney such that the exhaust gases rotate in an anticlockwise direction when viewed from the top of a vertical chimney.

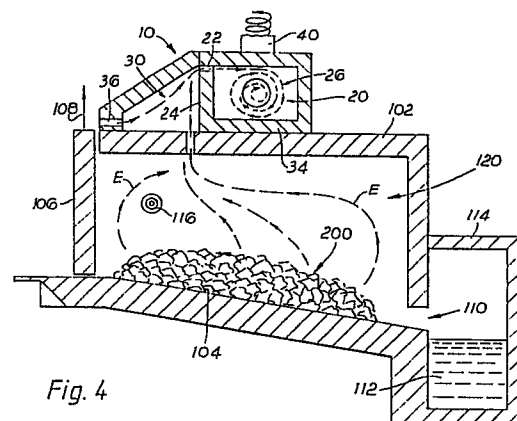


Fig. 4

Description

AFTERBURNERS

The present invention relates to afterburners and more particularly to afterburners for burning the exhaust gases from industrial processes or incinerators.

The exhaust gases from such sources often contain particles which give a smoky appearance to the chimney. If such processes are sited in or near an urban environment then the emission of smoke is unacceptable. Thus it is necessary to afterburn the smoke to produce a cleaner chimney outflow for environmental reasons.

A number of solutions have been adopted and a known solution is to pass the exhaust gases through a grid of firebricks the exhaust gases tending to heat the firebrick grid and to cause it to glow to an orange heat thereby igniting the exhaust gases which pass through and burning the smoke particles thereby producing a cleaner chimney emission. A disadvantage of this system is that although the centre part of the "grid" is well heated the outer edges do not necessarily heat up to a sufficient temperature to burn off the smoke particles and thereby the chimney emission is not clean.

It is an object of the present invention to provide an afterburner which is more efficient than the above known afterburner.

According to the present invention there is provided an afterburner for exhaust gases including means for causing the exhaust gases to move in a spiral manner within a chamber the chamber having an exhaust outlet for a chimney at a selected end thereof said end being predetermined by the desired movement of the exhaust gases.

Preferably the exhaust outlet is situated at an end of the afterburner such that the exhaust gases rotate in an anti-clockwise direction when viewed from the top of the chimney. That is to say the exhaust gases spiral in a clockwise direction up the chimney when viewed from the exhaust outlet of the afterburner.

The afterburner preferably includes a precombustion chamber within which polluted exhaust gases from a furnace are mixed with air prior to entry into the afterburner chamber.

The precombustion chamber is preferably generally triangular shaped in cross-section the air inlet being situated near to a first corner, the exhaust gas inlet near to a second corner and the exhaust into the main afterburner chamber near to the third corner.

In a particular embodiment the afterburner is situated on top of a furnace the exhaust gases from the furnace being fed into the precombustion chamber of the afterburner, the afterburner being situated adjacent to the input entry point for scrap material fed into the furnace, the air inlet for the precombustion chamber being situated in a position whereby on opening of the furnace to receive further scrap material the air flow is substantially reduced. Preferably the reduction is to virtually zero air flow.

Embodiments of the present invention will now be described, by way of example with reference to the

accompanying drawings in which:-

Figure 1 shows in diagrammatic partial cross-section a perspective view of an afterburner according to the present invention;

Figure 2 shows the afterburner of Figure 1 in front elevation;

Figure 3 shows a plan view of the chimney illustrating the movement of the exhaust gases; and

Figure 4 shows a furnace according to the present invention provided with an afterburner as shown in Figures 1 and 2.

With reference now to Figure 1, the afterburner 10 comprises a main combustion chamber 20 and a precombustion chamber 30. Exhaust gases E from, for example, a furnace (see Figure 4) enter chamber 30 via openings 32 in the firebrick floor 34 and are mixed with air A from the atmosphere which enters chamber 30 via openings 36 in the firebrick front wall 38.

The air and exhaust gas mixture (A + E) tends to ignite in the chamber 30 which will be at a very high temperature (once the furnace has been running for some period of time). The ignited mixture (A + E) is then constrained to enter the main combustion chamber 20 via openings 22 in the dividing firebrick wall 24. The mixture (A + E) enters at the top of chamber 20 and flows as shown by the arrowed path 26 in a general helical manner finally being exhausted through chimney 40 connected to the end wall 28 of chamber 20.

The chimney 40 is situated at a selected end of chamber 20 such that the exhaust moves up the chimney 40 in a cyclonic manner and rotates in an anticlockwise direction when viewed in plan view as shown in Figure 3. This is important in efficient operation since the cyclonic path imitates the natural movement of, for example, both water draining through a plug hole and is assisted by the natural cyclonic phenomenon.

The exhaust gases E which normally contain both solid and gaseous contaminants are therefore ignited and precombusted in chamber 30 and then subjected to a further combustion process in chamber 20 in which the cyclonic movement causes any particles to strike the walls of chamber 20 which become extremely hot (normally to white heat) thereby completely burning such particles. The gas mixture (A + E) entering chamber 20 is already preheated, firstly in the furnace and then in chamber 30 and therefore chamber 20 is at an extreme temperature causing combustion of virtually all contaminant material whether gaseous or solid.

With reference to Figure 2 an inlet 42 is preferably provided for introduction of an air/fuel mixture into chamber 20 at an end opposite to chimney 40. This is to assist in the start up of the afterburner and the air/fuel mixture may be modified to an air supply only once the afterburner has reached full operating temperature. Alternatively it may be shut off completely. A furnace 100 is indicated by wall member

102 and indicates that afterburner 10 may be placed at any convenient position to receive contaminated exhaust gases.

A particular arrangement is shown in Figure 4 to which reference is now made. The furnace 100 is of the sloping hearth type wherein contaminated scrap material 200 is fed onto the hearth 104 through a door 106. Door 106 is opened by sliding vertically in the direction indicated by arrow 108.

Furnace 100 is provided with an outlet 110 for example for molten aluminium 112 which is collected in a bath 114 at the end of the furnace remote from the door 106. The aluminium may be tapped from bath 114 in known manner.

Furnace 100 may be provided with a "start up" burner 116 in known manner to commence the combustion within a main chamber 120. Once combustion has commenced burner 116 may be shut off or continued to operate at a predetermined level dependent on the type of scrap introduced.

The exhaust gases E normally heavily contaminated pass through the opening 32 which in firebrick wall 34 is now an integral part of the roof of furnace 100. Alternatively afterburner 10 may be placed on top of a complete roof 102 of furnace 100 and corresponding matching holes provided to allow exhaust gases E to enter chamber 30.

The afterburner operates as described hereinbefore until further scrap material is introduced into chamber 120. Lifting of door 106 effectively blocks off inlet holes 36 and thereby reduces the chimney draught. Thus, new scrap material is allowed to burn initially more slowly until door 106 is again closed and thereby the excess contaminant which is present on new scrap will not be drawn up the chimney 40 at so high a rate that it cannot be burnt. The gases given off will be contained within chamber 120 and when door 106 closes they will then be gradually drawn off to be consumed in afterburner 10.

Claims

1. An afterburner for exhaust gases including means for causing the exhaust gases to move in a spiral manner within a chamber the chamber having an exhaust outlet for a chimney at a selected end thereof said end being predetermined by the desired movement of the exhaust gases.

2. An afterburner as claimed in Claim 1 in which the exhaust outlet is situated at an end of the afterburner such that the exhaust gases rotate in an anti-clockwise direction when viewed from the top of the chimney.

3. An afterburner as claimed in Claim 2 in which the afterburner includes a precombustion chamber within which polluted exhaust gases from a furnace are mixed with air prior to entry into the afterburner chamber.

4. An afterburner as claimed in Claim 3 in which the precombustion chamber is generally triangular shaped in cross-section the air inlet

being situated near to a first corner, the exhaust gas inlet near to a second corner and the exhaust into the main afterburner chamber near to the third corner.

5. An afterburner as claimed in any one of Claims 3 or 4 in which the afterburner is situated on top of a furnace the exhaust gases from the furnace being fed into the precombustion chamber of the afterburner, the afterburner being situated adjacent to the input entry point for scrap material fed into the furnace, the air inlet for the precombustion chamber being situated in a position whereby on opening of the furnace to receive further scrap material the air flow is substantially reduced.

6. An afterburner as claimed in Claim 5 in which the reduction is to virtually zero air flow.

7. An afterburner substantially as described with reference to the accompanying drawings.

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