ADJUSTABLE TERTIARY AIR SUPPLY MEANS FOR POT TYPE BURNERS

Fig. 1

Fig. 2

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The invention relates to an improvement in combustion rings for pot type burners. One purpose is the provision of a combustion ring or rings which shall provide a controllable supply of tertiary air in addition to the primary and secondary air employed in pot type burners. Another purpose is the provision of means for adjusting the flow of such tertiary air. Another purpose is to supply additional air to maintain full combustion rates at high altitudes. Another purpose is the provision of means for protecting the wall of a pot type burner above the secondary air inlets when such inlets are formed in the top of the pot itself. Another purpose is the prevention of recirculation under the combustion ring of heated gases from the combustion chamber above the pot. Another purpose is the provision of means for air cooling the combustion ring.

Other purposes will appear from time to time in the course of the specification and claims. The invention is illustrated more or less diagrammatically in the accompanying drawing where:

Fig. 1 is a vertical axial section;
Fig. 2 is a section on the line 2—2 of Fig. 1.
Like parts are indicated by like symbols throughout the specification and drawing.

Referring to the drawing, I generally indicates an outer shell or base portion of a burner, which may be supported in any suitable manner not herein shown. It may be upwardly extended to form a combustion or radiant chamber 12. It is provided with a bottom partition 2, having a central air inlet aperture 3, it being understood that air is permitted to flow inwardly to the space below the partition 2, and thence circulates upwardly through the aperture 3. 4 is a burner pot having an upwardly concave bottom 8, and any suitable fuel inlet means 6.

It will be understood that the line 6 may be controlled by any suitable valve means, automatic or manual, whereby a controlled supply of a suitable liquid fuel is supplied along the line 6 to the concave bottom 8 of the pot 4.

Primary air for mixture with the vaporized hydrocarbon is admitted through a plurality of primary air inlets 7, which are located at various levels in the wall of the pot 4. I may employ any suitable means for admitting secondary air, but herein show a plurality of larger and more closely spaced secondary air inlets 8. It will be understood that in the process of hydroxylation the liquid hydrocarbon is vaporised by the heat of combustion in or above the fire 1 and the vaporized hydrocarbon as it rises mixes with the primary air flowing through the primary air inlets 7 to form a mixture which is burned with the admixture of the secondary air supply through the secondary air inlets 8.

9 is a flame ring which rests upon the outer top flange 10 of the pot, which is shown as resting upon the supporting angle ring 11, mounted on the inner wall of the base member 1.

Any suitable flue means not herein shown may be employed for maintaining the circulation of air. 18 is an upper ring which may be made integral with the flame ring 9, as shown in Fig. 1, or which may be formed as a separate ring. In Fig. 1 the rings 9 and 15 are shown as joined by an outer wall 16. The flame ring is centered by the downwardly extending flange or cylindrical portion 18, which also protects the upper portion of the inner face of the pot 4 above the secondary air inlets 8. We find it desirable to tilt the secondary air inlet apertures 8 upwardly and inwardly, as shown in the drawing.

The flame ring has an upwardly and inwardly generally conic portion 19, generally parallel with the path of delivery of the secondary air. A downwardly and inwardly conic portion 20 serves to deflect and diffuse secondary air. In Fig. 1 this downwardly and inwardly extending portion supports at its outer edge a second upwardly and inwardly inclined portion 21, about which the secondary air, mixed with the primary air and the vaporized hydrocarbon, rises to escape through the central aperture defined by the ring structure. By deflecting and diffusing the secondary air, the high temperature zone of the furnace is brought down closer to the burner. The diffusion of the secondary air provides a more uniform mixture, and the maximum flame temperature occurs adjacent the center of the pot, with the maximum delivery of radiant heat to the bottom of the pot for vaporizing the liquid hydrocarbon.

A prime purpose of the structure is to provide a supply of tertiary air to the flame or to the mixture rising upwardly through the aperture in the flame ring which may readily be varied or controlled. In order to obtain this control and to maintain the tertiary air supply, we may form a plurality of holes 33 in the top flange 18 of the pot, which are aligned with corresponding holes 34 in the flame ring structure. 32 is any suitable handle or control means for rotating the
2 flame ring and for thereby varying the amount of overlap and the cross sectional area of the apertures through which air flows from the space between the pot and the wall into the interior of the flame ring for escape through the passage defined by the inner edges of the upper and lower rings.

It will be realized that, whereas we have described and illustrated a practical and operative device, nevertheless, many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of the invention. We therefore wish the description and drawing to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting us to our precise showing.

The use and operation of the invention are as follows:

In the employment of pot type burners in which primary and secondary air are employed to produce a mixture, there may be a deficiency of free oxygen in the combustion chamber. The combustion chamber may be tightly formed with a minimum of leakage. If there is such a deficiency, there is a tendency for the flame to burn alternately above and below the combustion ring, which results in unstable combustion and violent pulsation of flame.

The provision of the tertiary air supply provides excess air above the pot and tends to draw the level of combustion upwardly above the pot and the flame ring, and it stabilizes combustion at that point.

It is highly advantageous to supply the tertiary air from the space below the flame ring since, if tertiary air or excess air is admitted through the wall of the combustion chamber, pressure variations may cause an escape from the combustion chamber through whatever aperture or apertures are employed, which will release some of the by-products of combustion into the space being heated, which is highly disadvantageous. This situation is entirely obviated by the present structure.

If more tertiary air is employed than is needed, it tends to reduce combustion efficiency, and our structure permits a ready adjustment to obtain an optimum supply of tertiary air.

Thus, we can deliver the exact amount of air which is required to stabilize the flame to eliminate pulsation, without undue lowering of combustion efficiencies.

We provide means for maintaining and varying the control and controllable supply of tertiary air. In the normal use of the burner primary air is, of course, supplied through the apertures in the pot wall, and the secondary air is supplied through the apertures of the fully hydroxylated mixture is burned upon admixture with the secondary air, and any deficiencies in the secondary air supply are made good by the delivery of the tertiary air supply through the aperture or between the upper and lower flame rings.

While we have used the term "tertiary air," it will be understood that what is involved, in effect, is additional secondary air for completion of the hydroxylation process. It will also be understood that, if desired, all of the secondary air may be supplied through the space between the upper and the lower rings.

We claim:

1. In a pot type burner, a pot, the wall of which is provided with a plurality of primary air inlet apertures located at various levels, means for supplying a liquid fuel to the bottom of the pot, means for supplying secondary air to a level adjacent but below the top of the pot, including a plurality of upwardly and inwardly tilted secondary air inlets, and a flame ring located below said inlets and being formed of oppositely conic portions, the outer conic portion extending upwardly and inwardly in general parallelism with the path of delivery of the secondary air.

2. In a pot type burner, a pot, the wall of which is provided with a plurality of primary air inlet apertures located at various levels, means for supplying a liquid fuel to the bottom of the pot, means, adapted at high fire, for supplying secondary air to a level adjacent but below the top of the pot, a flame ring located above the level of said secondary air supply, said flame ring being mounted adjacent the top of the pot and having a central aperture, and means for supplying tertiary air above said flame ring, said flame ring having an outer upwardly and inwardly extending conic portion, an intermediate downwardly and inwardly extending conic portion, and an inner upwardly and inwardly extending conic portion.

3. In a pot type burner, a burner pot having an open end and a circumferential wall provided with a plurality of relatively sparsely spaced primary air inlet apertures located at various levels therein, said wall having, adjacent the opening of the pot, a single row of larger and more closely spaced secondary air inlet apertures, said last named apertures being inclined toward the mouth of the pot and means for delivering additional air at a level closer to the mouth of the pot than said secondary air apertures, including an air directing chamber having spaced, centrally apertured walls, the edges of said apertures forming an air directing space, the wall closest to the secondary air inlet apertures having a conic portion inclined inwardly toward the open end of the pot in general alignment with the direction of flow of the air from said secondary air inlet apertures.

4. In a pot type burner, a burner pot having an open end and a circumferential wall provided with a plurality of relatively sparsely spaced primary air inlet apertures located at various levels therein, said wall having, adjacent the opening of the pot, a single row of larger and more closely spaced secondary air inlet apertures, said last named apertures being inclined toward the mouth of the pot and means for delivering additional air at a level closer to the mouth of the pot than said secondary air apertures, including an air directing chamber having spaced, centrally apertured walls, the edges of said apertures forming an air directing space, the wall closest to the secondary air inlet apertures having a conic portion inclined inwardly toward the open end of the pot in general alignment with the direction of flow of the air from said secondary air inlet apertures, an intermediate conic portion inclined toward the closed end of the pot and an inner conic portion inclined toward the open end of the pot.

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