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INDUSTRIAL BURNER

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2 Sheets-Sheet 2

FIG. 2

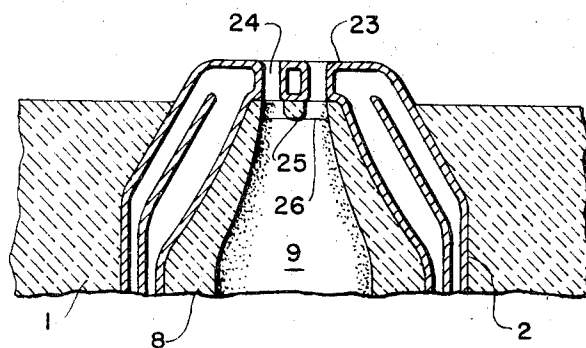
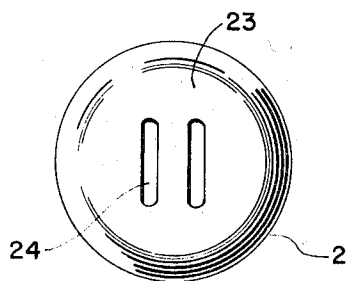


FIG. 3



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INDUSTRIAL BURNER

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4 Claims

ABSTRACT OF THE DISCLOSURE

A submerged combustion type burner that is located in a furnace wall below the level of the material being heated. Provision is made to remove the burner without losing material through the opening from which it was removed.

BACKGROUND AND SUMMARY

The present invention relates to burners, and more particularly to industrial burners of the so-called combustion chamber type.

In Dolf et al. Patent 3,260,587, there is disclosed a burner which includes as a part thereof, an air cooled casing that is inserted into an opening in a furnace wall. When it is necessary to remove this burner for repair or replacement, an opening remains in the wall through which the material being heated can flow, thus requiring the furnace to be shut down for the removal of a single burner. Frequently, this is impossible so that the furnace must continue operating without its full complement of burners.

In the construction with which this invention is concerned, there is provided a hollow sleeve, lining an opening in a furnace wall and forming part thereof. This sleeve has passages formed therein through which a cooling fluid, air or water, may flow. A burner is received in the sleeve and may be removed therefrom at will. When the burner is removed, the cooling effect of the fluid flowing through the sleeve will freeze the material adjacent thereto in the furnace so that the material will not flow through the opening left by the removal of the burner.

It is an object of the invention to provide a burner which may easily be inserted in and removed from a furnace wall. It is a further object of the invention to provide a burner that is particularly adapted for use in so-called submerged combustion where the burner is located below the surface of the material to be heated or melted and is fired directly into said material.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a section through a furnace wall and the burner located therein,

FIG. 2 shows a modified form of burner protecting sleeve and burner, and

FIG. 3 is a view from the top of FIG. 2.

DETAILED DESCRIPTION

Referring to FIG. 1, there is shown at 1 a furnace wall which can be either the bottom or a side wall of a furnace. This wall is provided with an opening below the level of the material being heated which receives a hollow, annular sleeve 2 of a suitable high temperature metal, and the end 3 of which extends a short distance into the

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interior of the furnace beyond the inner surface of wall 1. This sleeve is fastened in any suitable manner to the furnace wall to be, in effect, a permanent part thereof. The sleeve is provided with an annular baffle 4 to form passages for a cooling fluid that may be air or water. Fluid is supplied to the sleeve through an inlet 5 and is exhausted through an outlet 6.

A burner indicated generally at 7 is received snugly but removable in the sleeve. This burner includes an annular refractory member 8, the interior of which forms a combustion chamber 9 having a restricted discharge opening 11 that is concentric with and adjacent to end 3 of sleeve 2. The lower end of member 8 is received in a support casting 12 to which it is attached by any suitable means, such as being cemented in place. The casting 12 is provided with a flange that may be fastened to either the inlet and outlet, 5 and 6 respectively, or to the furnace wall in such a manner that the burner is properly located, but can be removed for repair or replacement. It is noted that, if desired, refractory member 8 can be enclosed in a thin metal casing that is fastened to casting 12 instead of being cemented thereto. The metal casing would be received snugly in sleeve 2.

Casting 12 is provided with a gas inlet 13 which communicates with an annular chamber 14 that has a series of discharge ports 15 through which fuel gas can be discharged into combustion chamber 9. Casting 12 also has an air inlet 16 that directs the air through a central passage 17 into the combustion chamber. The passage 17 has concentrically located in it a combination distributor and electrode 18. It will be noted that the upper end of the electrode is flared outwardly to direct the air in a sheet across the ports 15 so that air and gas will be thoroughly mixed. Electrode 18 is shown as being hollow and has a second electrode 19 extending through it, with the two electrodes being separated by insulating material 21. The electrode is held in position in the casting 12 by a bushing 22.

In the operation of the burner, gas and air in proper proportions, and which are regulated by any conventional ratio controller, are supplied to the burner and are introduced through the ports 15 and 17 respectively to the combustion chamber 9 where they are burned. The high temperature products of combustion are discharged at high velocity through the outlet port 11 to flow into and through the material that is being heated or melted in the furnace. This material can be glass or sodium silicate, or metal, for example. When the burner is initially operated, the electrodes 18 and 19 are moved up into the center of the combustion chamber and a spark is flashed across them to ignite the combustible mixture. Thereafter, the electrodes are moved back to the position shown so that outer electrode 18 serves to direct the air across the streams of gas as mentioned above.

During a normal operation of the burner the hot products of combustion are discharged at high velocity into and through the material in the furnace. If this material is molten it normally will flow back into the burner when the burner is not operating, or through the burner opening when the burner has been removed for replacement or repair. This is prevented by having a relatively cold sleeve 2 which projects slightly into the furnace. The cooling fluid flowing through this sleeve will cool the material immediately adjacent thereto sufficiently to cause it to freeze and thereby bridge over the opening in the upper end of this sleeve when the burner is not operating. Thus, the burner can be removed without any loss of the material being heated.

When the burner is shut down before removal, the gas will be shut off while air pressure is maintained in the chamber 9 until the material in front of the burner outlet

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is frozen. When again starting the burner it will be held loosely in sleeve 2 until the hot gases have melted the material in the front of the outlet. During this time the exhaust gases will flow back around member 8 or its casing, if one is used. When the material has melted, the burner will be moved into place and fastened there.

In some cases it may well be that the material being heated has a relatively low freezing point so that the opening in the end of sleeve 2 is too large to be bridged by the molten material. In such a case, construction of the type shown in FIG. 2 can be used. In this embodiment of the invention the sleeve 2 is closed as shown at 23 and is provided with a plurality of relatively narrow slots 24 through which the products of combustion are discharged into the furnace. In a like manner the upper end of refractory member 8 is also closed as shown at 25, and is provided with a plurality of slots 26 aligned with the slots 24. It will be seen that the end 25 of member 8 protects the sleeve 2 from the direct combustion of the fuel and air. The cooling around the slots 24 will protect the end of member 2 sufficiently to prevent its deterioration as the hot products of combustion are discharged through the slots into the furnace. This form of invention operates in exactly the same manner as the previous form but the smaller area of slots 24 will mean that there is a smaller area of the material to be frozen when the burner is removed.

While in accordance with the provisions of the statutes I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. In combination with a furnace wall having an opening therein, a hollow, annular sleeve forming a closed annular space fixed in said opening and extending beyond

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the outer surface of said wall, said sleeve having a first end of reduced area adjacent to the interior surface of said wall, means outside said furnace wall to supply a cooling fluid to said space from the extending portion of said sleeve, means outside said furnace wall to receive cooling fluid from the space through the extending portion of said sleeve, an annular refractory body snugly and removably received in said sleeve and having an end projecting beyond said sleeve and the outer surface of said wall, the interior of said body forming a combustion chamber with the portion thereof in said first end of said sleeve forming an exhaust port, a supporting member attached to the body at its projecting end, said member being provided with a series of ports through which fuel may be supplied to the combustion chamber, said member being provided with a port through which air can be supplied to said combustion chamber, and means carried by said member to ignite the fuel and air supplied to said combustion chamber.

2. The combination of claim 1 in which said first end of said sleeve extends beyond the wall and into the furnace.

3. The combination of claim 2 in which said first end of said sleeve extends across said opening and is provided with a plurality of slots through which combustion gases are discharged.

4. The combination of claim 1 in which said opening in said refractory body is of a smaller area than the combustion chamber formed therein.

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