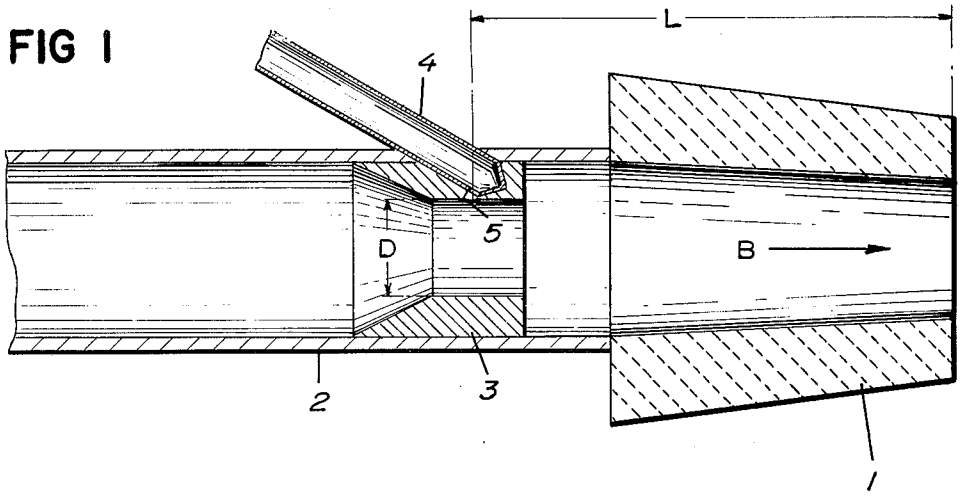
Sept. 21, 1965 SHIN HASHIMOTO ETAL 3,207,597

METHOD OF ADDING A LIQUID FUEL TO THE AIR BLAST IN A SHAFT FURNACE OR SPECIFICALLY IN A BLAST FURNACE

Filed Oct. 8, 1962

FIG 1



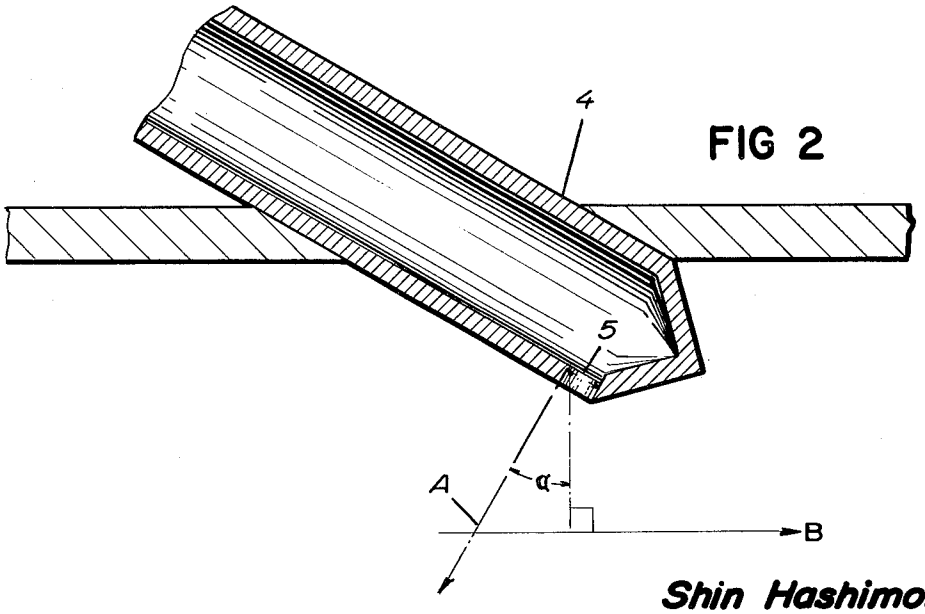


FIG 2

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United States Patent Office 3,207,597
Patented Sept. 21, 1965

3,207,597

METHOD OF ADDING A LIQUID FUEL TO THE AIR BLAST IN A SHAFT FURNACE OR SPECIFICALLY IN A BLAST FURNACE

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Filed Oct. 8, 1962, Ser. No. 229,112
Claims priority, application Japan, Oct. 19, 1961, 36/37,774
1 Claim. (Cl. 75—42)

This invention relates to a method of adding a liquid fuel such as, for example, a heavy oil or a light oil to the air blast in a shaft furnace or specifically in a blast furnace.

Generally, in the case of operating a shaft furnace or specifically a blast furnace by adding a liquid fuel to the air blast thereto, the liquid fuel will be atomized with the help of such gaseous medium as air or steam and the atomized liquid fuel together with the gaseous medium will be added to the air blast.

In such method, as the gaseous medium for the purpose of atomizing the liquid fuel is mixed into the air blast, there arise certain difficulties in the operation. For example as a result of mixing-in the air or steam for the atomization, the combusion temperature in front of the tuyere is lowered, the calculation of the heat- and material-balance within the furnace becomes difficult and the emergency cutoff operation will be complicated and further there are such disadvantages that additional equipment, as an air compressor or a steam generator, is required and the longer part of the liquid fuel conduit must be exposed to the air blast or the hot blast.

An object of the present invention is to provide a new method of adding a liquid fuel to the air blast in a shaft furnace or specifically a blast furnace wherein the above mentioned difficulties and disadvantages can be eliminated.

The method of the present invention comprises jetting liquid fuel into a conduit pipe between an inlet or a tuyere for introducing the air blast into the furnace and the point where the blast for the inlet is separated from the blast main pipe without the help of any gaseous medium so that the jet of liquid fuel may intersect the direction of the flow of the said air blast for atomizing the said liquid fuel and by adjusting one or more of the factors such as the direction of jetting-in the liquid fuel. the size of the jetting port, the temperature of the liquid fuel and the flow velocity of the air blast at the position of the jet, the atomization can be controlled.

According to the present invention, because no gaseous medium for the purpose of atomizing the liquid fuel is required, the lowering of the combustion temperature in front of the tuyere will be prevented and the heat- and material-balance can be correctly calculated and because no equipment for the said gaseous medium is required the installation cost will be reduced. In addition, the operation of the blast furnace will become much simpler. Further, according to the present invention, the length of the liquid fuel conduit which is exposed to heat can be reduced.

In the present invention, the position of jetting liquid fuels into the air blast is located between the tuyere and the point where the blast for the tuyere is separated from the blast main pipe so that at least a part of the jetted and atomized liquid fuel may burn before coming to the combustion zone within the furnace.

In case the flow velocity of the air blast at the point where the liquid fuel is jetted into the air blast is not adapted to the atomization of the liquid fuel, the said flow velocity should be adjusted with an adjustable flow-choking device in the proper position.

The pressure of the liquid fuel at the jetting port may be at least equal to the pressure required to jet-in the fuel against the air blast pressure.

The jetting port may be circular, rectangular, elliptic or of any other shape.

It is not necessary that the air blast contains steam or added oxygen for the purpose of the operation.

An embodiment of the present invention shall be explained with reference to the accompanying drawings.

FIGURE 1 illustrates a liquid fuel jetting port based on the principle of the present invention and positioned in the blow pipe of the blast tuyere of a blast furnace.

FIGURE 2 is a detailed view of the jetting port.

The present invention shall be detailed in the following with reference to the embodiment illustrated in the drawings.

In the drawings, **1** is a tuyere, **2** is a blow pipe and **3** is a ring which is provided on the inner periphery of the blow pipe **2** but which will not be required if the required air blast velocity is available. **4** is a liquid fuel conduit. **5** is a liquid fuel jetting port. The arrow A indicates the direction of jetting-in the liquid fuel. The arrow B indicates the direction of the air blast. In order to increase the flow velocity of the air blast at the point of jetting-in the liquid fuel, the ring **3** is fitted in that part of the blow pipe **2** and its inside diameter D is made to be 130 mm. Under the conditions at which experiments were carried out the flow of the air blast was 770 $Nm.^3/min.$, the pressure of the air blast was 680 $g./cm.^2$, the flow velocity of the air blast in the part fitted with the ring (which will not be required if the required air blast velocity is available) of the blow pipe was 220 m./sec., the distance L from the forward end of the tuyere **1** to the point of jetting-in the liquid fuel was varied between 200 and 1500 mm. and the point of jetting-in the liquid fuel was made of a heat-resisting steel such as, for example, SUS 27. The inside diameter of the jetting port was 2 to 4 mm. The angle α to the direction perpendicular to the direction of the air blast was 0 to 30° directed upstream of the air blast. (See FIGURE 2.) When a heavy oil at 90° C. was jetted at a velocity of 5 to 15 m./sec. into the air blast under the above mentioned conditions with the above mentioned device, the oil was completely atomized and introduced into the furnace.

What we claim is:

A method of adding liquid fuel to the air blast for a blast furnace, comprising the steps of constricting the flow of the air blast through the blow pipe at a point located at a distance of from 200 to 1500 mm. from the end of the tuyere on the end of the blow pipe to adjust the velocity of the air blast so that it is at least 220 m./sec., atomizing the liquid fuel by forcing a stream

consisting of liquid fuel into a blow pipe at said point and at an angle to the flow of the air blast which is between a perpendicular to the longitudinal axial direction of the blow pipe and to an angle which is 30° from said perpendicular in the upstream direction in said blow pipe, said stream being forced into the air blast at a flow velocity of 5 to 15 m./sec., and burning a part of the atomized liquid fuel between the point at which the fuel is forced into the blow pipe and the tuyere on the end of the blow pipe.

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