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⑥④ **Lance for repairing refining vessel.**

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⑤⑧ References cited:
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1980, Düsseldorf, H. SPERL "Das
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pages 125 to 127

⑦③ Proprietor: **KAWASAKI STEEL CORPORATION**
No. 1-28, 1-Chome Kitahonmachi-Dori
Chuo-Ku, Kobe-Shi Hyogo 651 (JP)

⑦② Inventor: **Hiramatsu, Teruo**
329-14, Kawado-Cho
Chiba City (JP)
Inventor: **Tanaka, Teifi**
2353-35, Shimozu-Shinden Yotsukaido-Machi
Inba-Gun Chiba Pref. (JP)
Inventor: **Tanno, Eiichi**
5-11, Chiyoda 3-Chome Yotsukaido-Machi
Inba-Gun Chiba Pref. (JP)
Inventor: **Nagamine, Tsuneo**
188-4 Nagauraekimae 430-2, Kuranami
Sodegaura-Machi Kitmitsu-Gun Chiba Pref. (JP)
Inventor: **Morimoto, Tadashi**
682-61, Nitona-Cho
Chiba City (JP)
Inventor: **Tsukamoto, Masaaki**
4-12, Chishirodai-Kita 2-Chome
Chiba City (JP)

⑦④ Representative: **Overbury, Richard Douglas et al**
HASELTINE LAKE & CO Hazlitt House 28
Southampton Buildings Chancery Lane
London WC2A 1AT (GB)

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Description

This invention relates to a spray lance for a flame gunning device for repairing partially damaged portions of the refractory linings of refining vessels such as converters for steel making and more particularly, but not exclusively, it is concerned with a lance for spraying melted or sintering or semisolid refractory material against the walls of vessels such as steel making converters and for removing accumulated adhering substances from the bottoms of furnaces.

A method of repairing partially damaged portions of the refractory lining of refining vessels such as steel making converters is disclosed in United States patent No. 3,883,078. In this method pulverized refractory repairing material, pulverized solid fuel and oxygen are sprayed through a nozzle at the front end of a lance against the surface of the furnace wall of the refining vessel at a high temperature, for example, 1,350—1,500°C, immediately after delivery or removal of the molten steel from the furnace so that the damaged or consumed portion of the refractory lining is coated with the melted or semisolid refractory repairing material produced from the pulverized refractory repairing material by fuel combustion whereby the refractory repairing material becomes joined to the lining refractory.

The equipment used, in this gunning method, is shown in Figure 1 of the accompanying drawings. The equipment includes a spray lance having one end rotatably supported on a movable trolley 3. The other end 1 is curved and has affixed thereto a nozzle 2 extending in a radial direction with respect to the lance axis. With this arrangement, as only one nozzle 2 is used to repair the cylindrical wall of the refining vessel, the lance is required to have the curved end 1. Such a conventional spray lance is suitable only for repairing a lining partially or locally and requires much time if it is used for repairing a wider area.

In *Stahl and Eisen*, Vol. 100, No. 3, pages 125 to 126, H. Sperl discusses the flame gunning method and discloses the use of a lance having a plurality of nozzles radially directed with respect to the lance axis.

It is an object of the invention to provide an improved lance which eliminates the disadvantages of the prior art.

According to the present invention there is provided a lance for repairing the wall of a refining vessel by flame gunning said lance including (a) multiple concentric tubes forming a passage for repairing material to be sprayed and a passage for a combustion supporting gas and (b) at least one nozzle provided on the cylindrical surface of the lance and consisting of two concentric pipes communicating with said passages respectively characterised in that said nozzle is forwardly inclined at an angle to the longitudinal axis of the lance.

In a particularly preferred embodiment, the lance includes a plurality of nozzles extending in

various directions. The nozzles may, for example, be provided along a generator of the cylindrical surface or in pairs at diametrically opposed positions. Preferably the nozzles are selectively closable by means of plugs so as to be able to freely adjust the delivery amount, range and direction of the repairing material and the gas to effectively repair refractory walls in the most preferable condition.

In a further embodiment, the front end of the lance is such that combustion supporting gas only is emitted for the purpose of removing adherent substances accumulated on the bottom of the furnace.

For a better understanding of the invention and to show how the same may be carried out, reference will now be made, by way of example, to the accompanying drawings in which:—

Fig. 1 is a perspective view of the conventional flame gunning device and lance as above mentioned;

Fig. 2 is a schematic sectional view of an embodiment of a lance according to the invention; and

Fig. 3 is a schematic sectional view of another embodiment of a lance according to the invention.

Referring to Fig. 2 illustrating one embodiment of a lance according to the invention, the lance 12 consists of four concentric tubes forming four passages 18, 19, 20 and 21. The central flow passage 18 is for powdered refractory repairing material (e.g. MgO and carbon powder) together with a carrier gas (N₂), the annular flow passage 19 surrounding the central flow passage 18 is for a combustion supporting gas (e.g. a gas including more than 50% oxygen), and the two outer annular passages 20 and 21 which communicate with each other and surround the passages 18 and 19 are for feeding and returning cooling water. As an alternative, the central passage 18 may be used for the combustion supporting gas, and the annular passage 19 may be used for the repairing material.

The lance 12 includes a plurality of nozzles 16. These are located on the outer cylindrical surface and the front end of the lance and each nozzle 16 communicates with the central passage 18 and the annular passage 19. Each nozzle 16 consists of an inner nozzle pipe 16a communicating with the central passage 18 and an outer nozzle pipe 16b concentric with the inner nozzle pipe 16a and communicating with the annular passage 19. The nozzles 16 on the cylindrical surface of the lance are inclined forwardly at an angle to the longitudinal axis 1 of the lance and the nozzle at the front end of the lance extends in the axial direction. The inclination of the nozzles on the cylindrical surface is advantageous from the point of view of the resistance to the flow of the powder.

The lance 12 may be provided, on its cylindrical surface, with only one nozzle 16 or a plurality of nozzles 16 as the case may be. Such a plurality of nozzles 16 is preferably arranged along at least

one generator of the cylindrical lance. A lance having thus arranged nozzles is advantageous for repairing wider areas of a wall at a time and, when some of the nozzles have been plugged, can also be used for local or partial repairing of the wall. The use of plugs for some of the nozzles allows control of the direction of spraying and of the amount of combustion supporting gas and repairing material sprayed. In this way repairs can be effected appropriate to the position and the degree of damage without any superfluous effort.

Fig. 3 illustrates a further embodiment of the invention, wherein the lance 12 includes a furnace bottom cleaning device for removing adhesive substances from the furnace bottom. These adhesive substances decrease the volume of the furnace and arise as a consequence of insufficient slag removal in, for example an upper blow converter or the like requiring agitation gas to be blown into the converter through the furnace bottom. In order to effect the cleaning operation, a nozzle 16 is not provided at the front end of the lance. On the contrary, the front end of the passage 18 for the repairing material is closed at 24 to form a cleaning opening 23 extending in the axial direction of the lance and communicating with the annular passage 19 for the combustion supporting gas. With this arrangement, when the lance is inserted into the converter, the cleaning opening 23 is in opposition in the furnace bottom, so that a part of the combustion supporting gas which is introduced contacts the high temperature adhesive substances on the furnace bottom and causes the same to melt so as to ensure the cleaning of the bottom. As an alternative, if the central passage 18 is used for the combustion supporting gas, the cleaning opening 23 is arranged at a location corresponding to the central passage 18.

As can be seen from the above explanation, the lance according to the invention can effectively perform controlled repairs to the linings of furnaces to bring good results in life, cost and rate of operation of the furnaces. In addition, the lance according to the invention has a remarkable advantage when hot repairing a refining furnace in that not only is it capable of repairing wider areas of the furnace wall at a time but also it is simultaneously capable of cleaning the furnace bottom.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details can be made therein without departing from the spirit and scope of the invention.

Claims

1. A lance for repairing the wall of a refining vessel by flame gunning said lance including (a) multiple concentric tubes forming a passage for repairing material to be sprayed and a passage for a combustion supporting gas and (b) at least

one nozzle provided on the cylindrical surface of the lance and consisting of two concentric pipes communicating with said passages respectively characterised in that said nozzle is forwardly inclined at an angle to the longitudinal axis of the lance.

2. A lance as claimed in claim 1, wherein a plurality of said nozzles is provided along a generator of the cylindrical surface of the lance.

3. A lance as claimed in claim 1 or 2, wherein a plurality of said nozzles is provided, pairs of said nozzles being provided on the cylindrical surface of the lance at diametrically opposed positions.

4. A lance as claimed in any one of the preceding claims and including a plurality of nozzles wherein a plug is fitted into at least one nozzle so as to close it.

5. A lance as claimed in any one of the preceding claims wherein there are four of said concentric tubes, the two inner tubes being for the repairing material and the gas and two outer tubes being for feeding and returning a cooling medium.

6. A lance as claimed in any one of claims 1 to 5 wherein additionally a nozzle is provided at the front end of the lance.

7. A lance as claimed in any one of claims 1 to 5 wherein the front end of the lance is such as to allow egress, in an axial direction, of said gas only without said repairing material.

Patentansprüche

1. Eine Lanze zum Ausbessern der Wandung eines Frischgefäßes durch Flammenschießen, wobei besagte Lanze (a) eine Vielzahl konzentrischer Rohre, die eine Passage für das Ausbesserungsmaterial, das eingesprüht werden soll, und eine Passage für ein verbrennungspeisendes Gas bilden, und (b) zumindest eine Düse, die an der zylindrischen Oberfläche der Lanze vorgesehen ist und aus zwei konzentrischen Kanälen besteht, die mit besagten Passagen kommunizieren, aufweist, dadurch gekennzeichnet, daß besagte Düse in einem Winkel zur Längsachse der Lanze nach vor geneigt ist.

2. Eine Lanze gemäß Anspruch 1, bei der eine Mehrzahl von besagten Düsen entlang einer Erzeugenden der zylindrischen Oberfläche der Lanze vorgesehen ist.

3. Eine Lanze gemäß dem Anspruch 1 oder 2, bei der eine Mehrzahl von besagten Düsen vorgesehen ist, wobei Paare von besagten Düsen an der zylindrischen Oberfläche der Lanze an genau entgegengesetzt liegenden Positionen vorgesehen sind.

4. Eine Lanze gemäß einem der vorhergehenden Ansprüche und eine Mehrzahl von Düsen aufweisend, bei der ein Stöpsel in zumindest eine Düse eingepaßt ist, um sie so zu verschließen.

5. Eine Lanze gemäß einem der vorhergehenden Ansprüche, bei der vier von besagten konzentrischen Rohren vorhanden sind, wobei die zwei inneren Rohre für das Ausbesserungs-

material und das Gas und zwei äußere Rohre für das Anspeisen und Zurückführen eines kühlenden Mediums bestimmt sind.

6. Eine Lanze gemäß einem der Ansprüche 1 bis 5, bei der zusätzlich eine Düse am Frontende der Lanze vorgesehen ist.

7. Eine Lanze gemäß einem der Ansprüche 1 bis 5, bei der das Frontende der Lanze derartig ist, um ein Austreten von besagtem Gas, in einer axialen Richtung, nur ohne besagtes Ausbesserungsmaterial zu erlauben.

Revendications

1. Une lance pour réparer la paroi d'un récipient d'affinage par projection à la flamme, cette lance comprenant (a) plusieurs tubes concentriques délimitant un passage pour le matériau de réparation destiné à être pulvérisé et un passage pour le gaz assurant la combustion et (b) au moins un ajutage ménagé sur la surface cylindrique de la lance et constitué par deux tubes concentriques communiquant chacun avec un passage, caractérisé en ce que cet ajutage est incliné vers l'avant en faisant un angle avec l'axe longitudinal de la lance.

2. Une lance selon la revendication 1, dans

laquelle plusieurs ajutages sont disposés le long d'une génératrice de la surface cylindrique de la lance.

3. Une lance selon l'une des revendications 1 ou 2, dans laquelle il est prévu plusieurs desdits ajutages, des couples de ces ajutages étant disposés à des positions diamétralement opposées sur la surface cylindrique de la lance.

4. Une lance selon l'une quelconque des revendications précédentes et comportant plusieurs ajutages dans laquelle on introduit un bouchon dans au moins un ajutage pour le fermer.

5. Une lance telle que revendiquée dans l'une des revendications précédentes, dans laquelle il est prévu quatre tubes concentriques, les deux tubes intérieurs étant destinés au matériau de réparation et au gaz et les deux tubes extérieurs étant destinés à l'amenée et à l'évacuation d'un milieu de réfrigération.

6. Une lance telle que revendiquée dans l'une des revendications 1 à 5, dans laquelle de plus un ajutage est prévue à l'extrémité avant de la lance.

7. Une lance telle que revendiquée dans l'une quelconque des revendications 1 à 5, dans laquelle l'extrémité avant de la lance est conçue de manière à ne permettre la sortie dans le sens axial que du gaz sans le matériau de réparation.

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FIG. 1
PRIOR ART

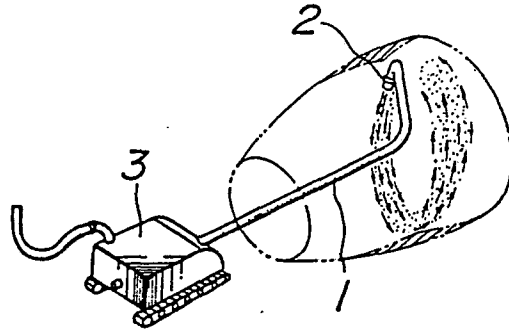


FIG. 2

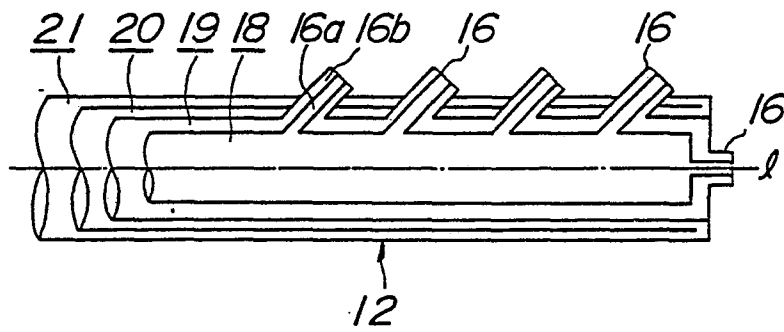


FIG. 3

