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OXYGEN BLOWING LANCE FIXING DEVICE FOR METALLURGICAL REFINING FURNACES

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2 Sheets-Sheet 1

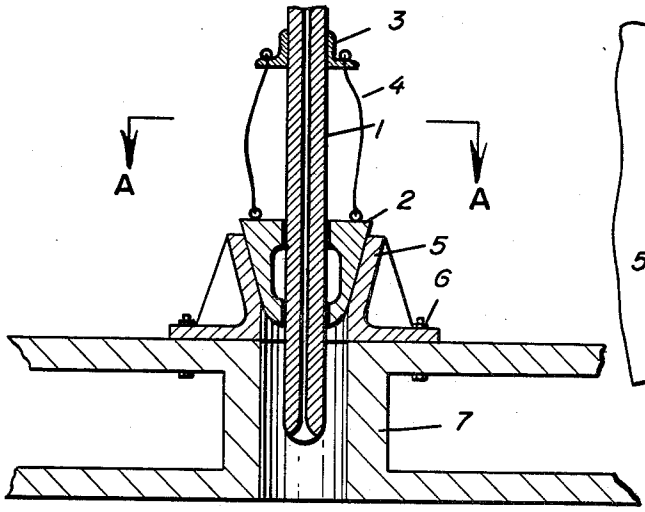


FIG 1

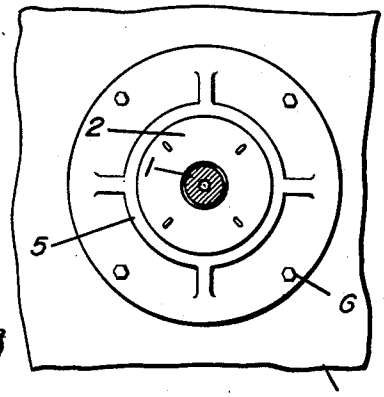


FIG 2

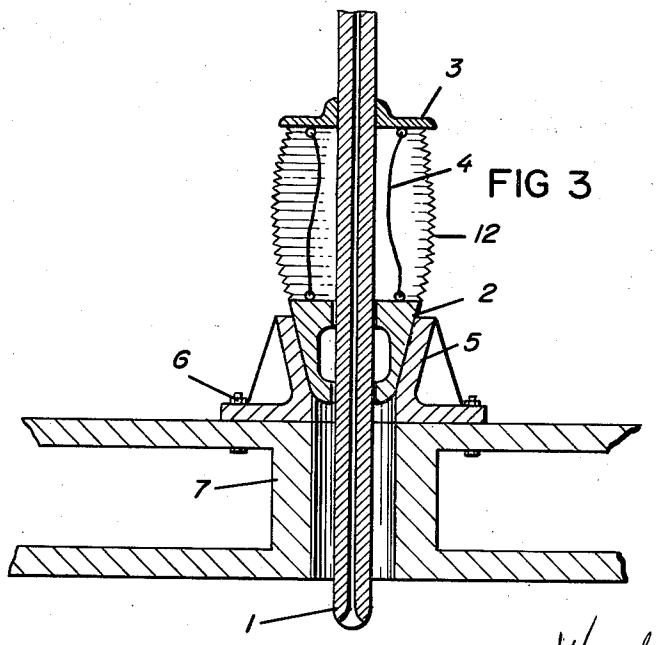


FIG 3

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FIG 4

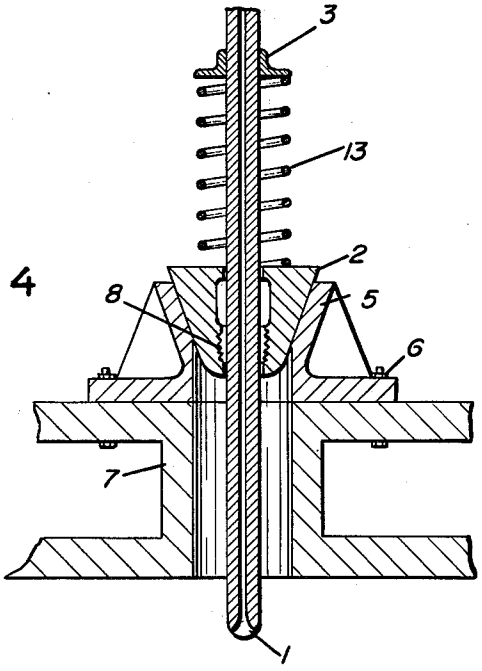
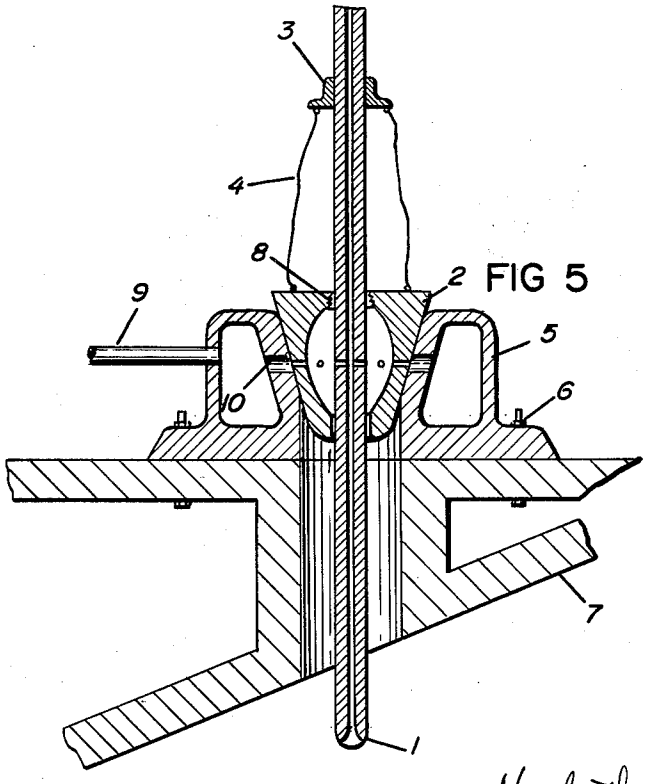


FIG 5



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OXYGEN BLOWING LANCE FIXING DEVICE FOR METALLURGICAL REFINING FURNACES

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5 Claims. (Cl. 266—34)

This invention relates to an improvement in a device for mounting an oxygen blowing lance used in a steel making method employing pure oxygen, and more particularly to an improvement in a device for mounting an oxygen blowing lance on an oxygen top-blowing converter and an open-hearth furnace.

Recently, the use of pure oxygen for quickly and efficiently refining the steel in a converter or open-hearth furnace has been developed extensively. The development of a highly efficient oxygen top-blowing converter has been particularly striking. When blowing pure oxygen onto the molten pig iron in an oxygen top-blowing converter by means of a lance, however, it is necessary to be able to insert the lance freely into the converter in a downward vertical direction and pull it up again. Generally, while blowing oxygen onto the surface of the molten pig iron in a converter, slag will be deposited on the part of the lance inserted into the converter. Therefore, in order to be able to pull the lance up through the hood provided at the mouth of converter with slag deposited thereupon, an aperture must be provided in the upper part of the hood which is large enough to afford sufficient clearance between the lance and the periphery of said aperture for permitting the lance and slag to pass through freely. However, such an aperture would permit the high temperature gas produced in the converter to blow off violently through said clearance, and thereby deterioration of the lance fixing device or the lance pulling-up device will be hastened. Moreover, as the lance is quite long and the high pressure oxygen is jetted through the lance at a high speed, a violent oscillation of the lance is unavoidable.

To meet these disadvantages the following measures have been taken in conventional methods and apparatus. For instance, to prevent the high temperature gas from violently blowing off through the aperture, a gas curtain of a high pressure gas such as compressed air or steam has been formed in the aperture, but such a high pressure gas curtain causes an intolerable noise which makes the operation practically impossible. Moreover, when recovering the waste gas from the oxygen top-blowing converter in the unburnt state, the sealing gas escaping from the gas curtain forming device will be mixed with the unburnt gas, so that the quality of recovered waste gas will be lessened. Further, to prevent the oscillation of the lance, a fixing device has been provided in conventional methods and apparatus, in which, for instance, laterally movable rollers or holders are advanced or retracted by an air cylinder or the like so that the lance can be fixed at the desired position. However, in the conventional methods of fixing the lance, devices of a large size are usually needed and the prevention of leakage of gases produced in the converter is not effected by these devices.

A principal object of the present invention is to provide a simple lance fixing device secured around the lance aperture made in the top of a conventional open-hearth furnace or the hood of an oxygen top blowing converter so that the oxygen blowing lance can be securely fixed and the waste gas produced in the furnace can be effectively prevented from leaking out through said aperture.

A further object of the present invention is to provide

a lance fixing device in which a gas is blown into the device under pressure to prevent the waste gas produced in the furnace from leaking out.

The other objects of the present invention will be understood from the following detailed explanation and the accompanying drawings.

FIGURE 1 is a vertical sectional view of an embodiment of the present invention.

FIGURE 2 is a cross-sectional view on line A—A in FIGURE 1.

FIGURES 3, 4 and 5 are vertical sectional views of the other embodiments of the present invention.

The present invention shall be described in detail with reference to the embodiments illustrated in the drawings.

In FIGURE 1, **1** is an oxygen blowing lance, **2** is an inner sealing ring, **3** is a hanger fixed on the lance **1**, **4** is a suspension cable for the inner sealing ring **2**, **5** is an outer sealing ring for receiving the inner sealing ring **2**, **6** designates one of a plurality of securing bolts for the outer ring **5**, and **7** is a hood or cover provided in the furnace port of the top blowing converter. The outer ring **5** is fixed around an opening port in the hood. The inside surface of the hole in said ring has an upwardly diverging taper and the outside surface of said inner sealing ring **2** has an upwardly expanding taper and its surface contacts the inside surface of outer ring **5** and is smooth so that the inner ring **2** is in closed gas tight contact with the inside surface of the outer ring **5** due to its own weight. The inside surface of the hole in the inner ring **2** fits closely around the lance **1** so that the lance can rise and fall freely and oscillation of the lance will not occur and the leakage of the gas produced in the converter may be effectively prevented, since the inner sealing ring **2** is made comparatively thick in the vertical direction.

The suspension cable **4** is connected at its upper end to the hanger **3** fixed to the lance and is fastened at the lower end to the inner sealing ring **2**. The suspension cable **4** may be a wire rope, chain, coil or bellows. It is preferably flexible. The hanger **3** is fixed on the lance **1** at a position which permits the lance to go up and down in the converter freely and the hanging wire has a length such that the inner sealing ring **2** fits tightly into the outer ring **5** when the lance is put down into the converter and it is pulled up out of outer ring **5**, before the part of the lance on which slag is deposited reaches the inner sealing ring **5** when the lance is pulled up. That is to say, the length of the suspension wire is a little longer than the distance between the hanger **3** and the inner sealing ring **2** when the lance is in its normal position, so that the inner sealing ring **3** will fit into the outer ring **5** when the lance is put down, but it will not be so long that the inner ring **2** will not be pulled out of outer ring **5** before the slag on the lance hits the ring **2** when pulling up the lance.

By the above described structure of the device according to the present invention the lance is securely fixed in the converter, the positioning of the lance in the converter can be controlled and the leakage of gases produced in the converter can be effectively prevented. Moreover, this device has the advantage that it is very simple and accordingly no large installation space is needed.

The same device may also be applied to an open-hearth furnace without adding any special element. The only difference is that when applying this device to an open-hearth furnace it is not necessary to pull up the lance each time the tapping is carried out as in the case of a converter. The lance is pulled up only when it is worn and to be repaired. However, when this is done the same advantages are obtained as in a top-blowing converter.

FIGURE 3 shows an embodiment in which a flexible bellows **12** somewhat longer than the suspension cable **4** is provided outside or inside the suspension cables **4** between the inner sealing ring **2** and the hanger **3** in a structure otherwise the same as that of FIGURE 1 so that even the slight amount of waste gas leaking out through the clearance between the lance **1** and the airtight ring **2** cannot escape to the atmosphere.

In such case, the suspension cable **4** can be omitted.

FIGURE 4 shows an embodiment wherein the amount of the leakage of the gas is required to be smaller than in the case of FIGURE 1 and a metallic labyrinth **8** is provided inside the inner sealing ring **2** so that the leakage of the gas through the clearance between it and the lance **1** may be reduced to an amount as small as possible.

Further, the suspension of the inner ring **2** is by means of a coil spring **13** and no specific suspension cable is required.

FIGURE 5 shows a further embodiment in which the outer sealing ring **5** is hollow and sealing gas inlet pipes **9** are provided on the outside of said hollow outer ring **5**. A proper number of elliptic holes **10** is provided on the inside surface thereof opposed to the inner sealing ring **2** and also a proper number of elliptic holes **11** communicating with said holes **10** is provided through said inner sealing ring **2**. A metallic labyrinth **8** is provided in the upper part of the inside of the ring **2** facing the lance **1**. The sealing gas introduced through a sealing gas inlet pipe **9** will be introduced into the inside of the outer ring **5** and will then be discharged into a space formed by the inner sealing ring **2** and the lance **1** through the communicating holes **10** and **11**.

In this embodiment, a part of the gas will go upward along the lance **1** and will escape along the lance **1** outward of the inner sealing ring while being obstructed by the labyrinth **8**, but the greater part of the gas will go downward along the lance **1** and will be jetted into the furnace gas, so that the furnace gas can be prevented from entering the inside of the inner sealing ring **2** along the lance **1**.

What we claim is:

1. An apparatus for mounting an oxygen blowing lance for use in an apparatus for refining steel, comprising an outer sealing ring adapted to be secured around an aperture provided in the upper part of a covering over the apparatus through which aperture the lance may go up and down freely, said outer sealing ring having an inside surface which is upwardly diverging, an inner sealing ring having an outside surface which is upwardly diverging and which fits tightly with the inside surface of said outer sealing ring, said inner sealing ring having a central bore therethrough, a lance extending through the bore close to the surface of said inner ring which defines said bore, a hanger fixed to the lance at a position above said inner ring, flexible suspension members mounted at the upper end on said hanger and connected at the lower end to said inner ring and connecting the hanger and the inner ring so that said inner ring is pulled up out of said outer ring by said suspension members when said lance is withdrawn from the aperture in the covering.

2. An apparatus as claimed in claim **1** in which said hanger is fixed to said lance sufficiently far above said inner sealing ring when said lance is in the normal position that said lance can move up and down in the apparatus, and said suspension members are wires having a length sufficient to pull said inner ring out of said outer ring before a slag covered end of said lance reaches the position of said outer ring when the lance is being withdrawn.

3. An apparatus as claimed in claim **1** in which said flexible suspension member is a coil spring, and said surface of said inner ring which defines said bore has a labyrinth structure therein at the lower end thereof.

4. An apparatus as claimed in claim **1** and a bellows connected between said hanger and said inner sealing ring for sealing off the escape of gases escaping through the inner sealing ring.

5. An apparatus as claimed in claim **1** in which said outer sealing ring has an annular hollow interior, an inlet pipe connected to said outer ring opening into said hollow interior for admitting a sealing gas into said hollow interior, said outer sealing ring having a plurality of holes therein opening through the inside surface thereof, and said inner sealing ring having a plurality of holes therein extending therethrough from the outside surface thereof to the inside surface thereof and communicating with said holes in said outer sealing ring for conducting sealing gas to the interior of said inner sealing ring.

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