Dec. 19, 1967 J. LAMBRECHT ETAL 3,358,978

WASTE GAS MAIN FOR ELECTRIC FURNACES, PARTICULARLY ARC FURNACES

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FIG. 2

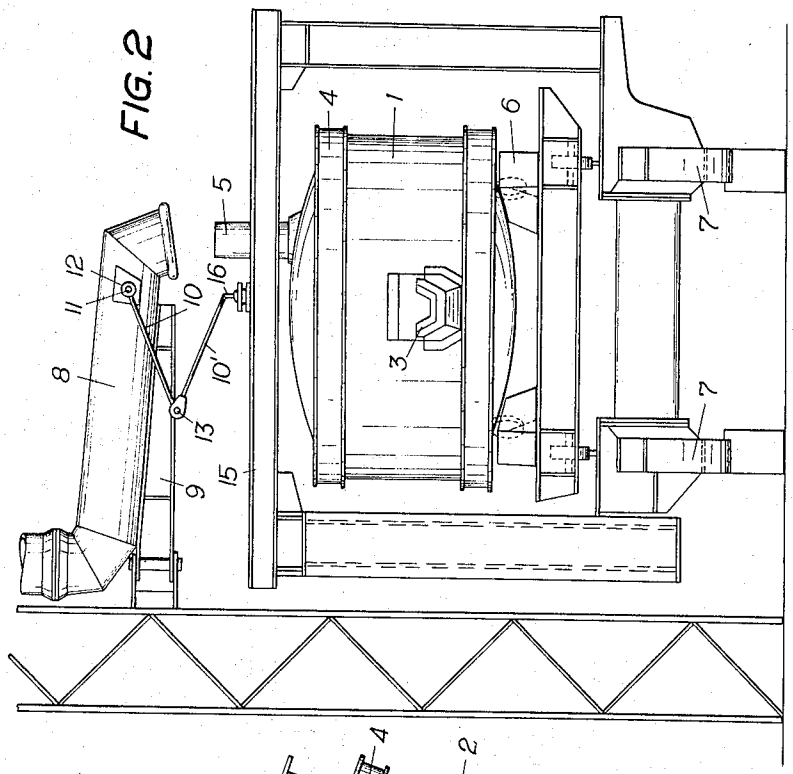
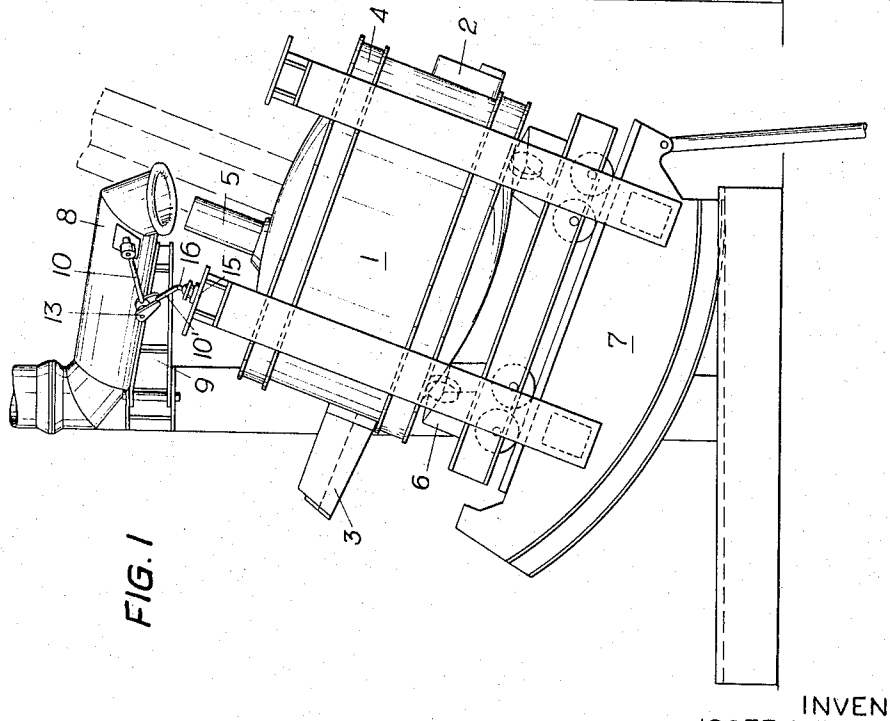


FIG. 1



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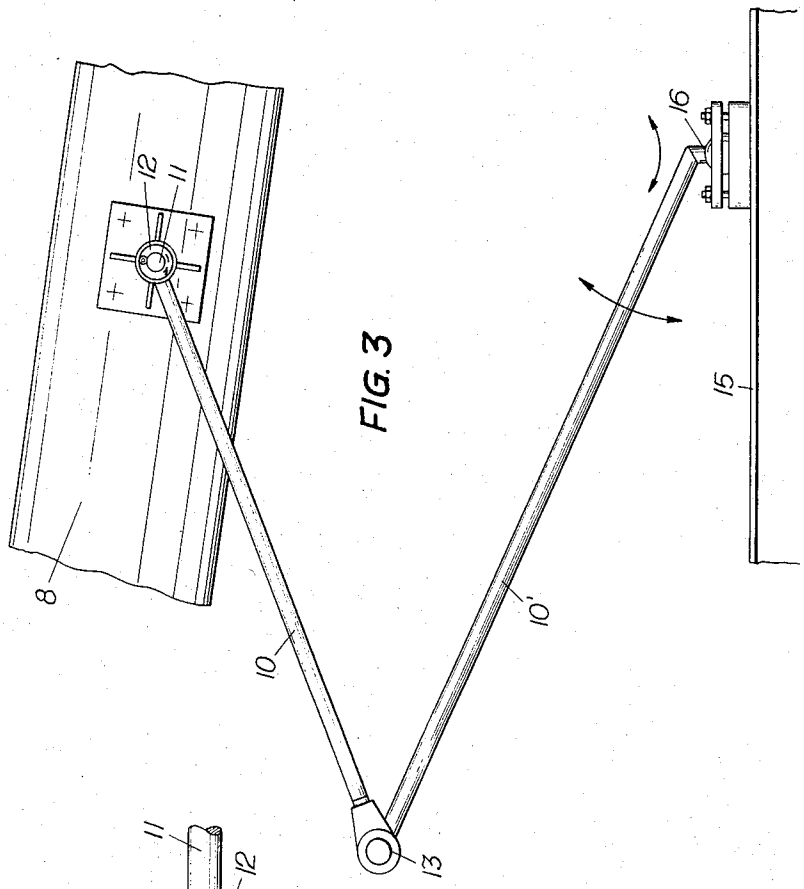

FIG. 3

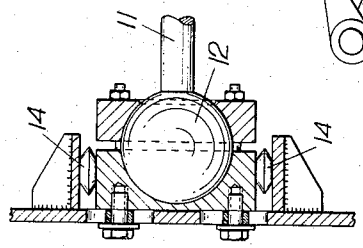

FIG. 5

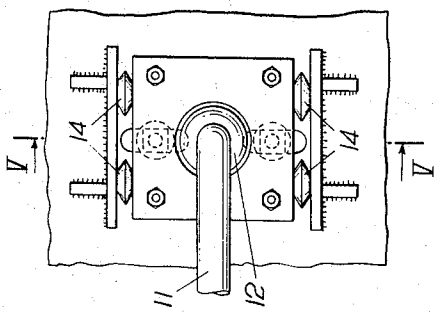

FIG. 4

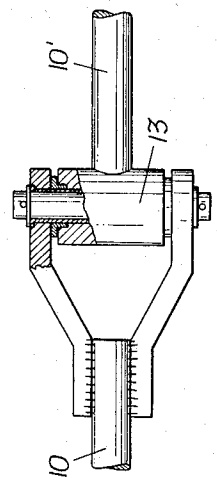

FIG. 6

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WASTE GAS MAIN FOR ELECTRIC FURNACES, PARTICULARLY ARC FURNACES

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Filed Aug. 19, 1965, Ser. No. 480,926
Claims priority, application Austria, Sept. 2, 1964, A 7,574/64
5 Claims. (Cl. 263—33)

ABSTRACT OF THE DISCLOSURE

This invention relates to a waste gas system for a tiltable electric furnace having a socket conduit for discharge of waste gases and a waste gas conduit mounted for swinging movement in a substantially horizontal plane above the top of the electric furnace, the socket conduit and the waste gas conduit being maintained in alignment by a linkage system including a pair of arms or links connected to each other by a fork joint and having their other ends connected respectively to the waste gas conduit and the furnace by means of ball and socket joints.

In the manufacture of alloy steels in an electric furnace, particularly in an arc furnace, the smelting of the charge is mostly followed by a refining operation with pure gaseous oxygen whereby large amounts of heat are generated within a short time. The carbon oxide escaping during this procedure must be discharged and burnt. In normal arc furnaces the furnace gases, due to the overpressure prevailing in the vessel, escape through the existing openings of the furnace, i.e. through the charging doors, the tap hole and the orifices for the electrodes in the cover, that is to say, through the annular gaps remaining around the electrodes, and through other leakages, e.g. at the sand coffering, into the furnace bay. This means a troublesome handicap to the furnace personnel; it is necessary to have an adequately large furnace bay, and powerful roof ventilators have to be provided, the environs of the steelworks being nevertheless molested by smoke.

The regulations against air pollution, which become more and more stringent, have made it necessary to employ dust removing plants, for which purpose the off-gases from the furnace have to be trapped. With trapping funnels arranged above the furnace casing, however, this can be accomplished only with a multiple dilution of the off-gases with infiltrated ambient air. For this reason, it has recently been proposed to provide, in the cover of an arc furnace, a waste gas opening and a correspondingly dimensioned socket, through which the waste gas is discharged into the open via a dust removing plant. Conditional on its function, the arc furnace must be capable of various movements; it must, for instance, be adapted to be moved, to some extent, in horizontal direction, and it must be capable of being tilted in a vertical plane determined by the tap hole and by the furnace axis. These movements cause the mentioned waste gas opening and the waste gas socket in the furnace cover, respectively, to describe a cycloidal curve in said vertical plane. It is, therefore, practically impossible to join the waste gas socket immediately to the waste gas conduit leading to the dust removing plant, because the hot off-gases from the furnace would soon damage the joints necessary in the pipe lines. Consequently, the waste gas conduit has been arranged to be slewable over the furnace in such manner that its intake end, which cooperates with the waste gas socket, is capable of taking up the waste gases

in the most important furnace positions. However, this necessitates the waste gas conduit to be swung, in each case, over the waste gas socket, which has hitherto been effected by hand.

This is where the invention comes in by providing a device for automatically adjusting the waste gas conduit in dependence on the furnace position. This device is characterised by an articulated linkage by which the slewable end of the waste gas conduit is connected to a suitable point of the arc furnace and its casing, respectively. In particular, the articulated linkage comprises an arm connected by means of a ball joint to the cable bridge of the furnace and to the swing pipe of the waste gas conduit, respectively, and a second arm connected to the swing pipe of the waste gas tube and to the cable bridge, respectively, which two arms are connected to each other by means of a fork joint. Preferably, the ball joint connecting the arm to the swing pipe and to the cable bridge, respectively, is provided with spring elements.

The invention is illustrated in the accompanying drawings. FIG. 1 is a showing of the arc furnace tilted backward for deslagging. FIG. 2 is a representation as viewed from the pouring side. FIG. 3 is a diagrammatic representation of the two arms, FIG. 4 a showing of the ball joint on the swing pipe, FIG. 5 is a transverse sectional view thereof, and FIG. 6 is a showing of the fork joint.

Numeral **1** designates the furnace casing of the arc furnace; numeral **2** denotes the furnace door, **3** is the tap hole, **4** the sand coffering, **5** the waste gas socket provided in the furnace cover. The vessel is adapted to be moved horizontally to a limited extent on a bogie **6** and tiltable on a cradle **7**. Numeral **8** designates the slewable waste gas pipe, which rests on a console **9** and is slewable together with the latter in a horizontal plane.

When the furnace is tilted, all points of the waste gas socket on the furnace cover describe a cycloidal curve in a vertical plane. For joining up the swing pipe, the device of the invention, comprising the arms **10** and **10'**, is provided. The two arms are connected with each other through a fork joint **13**. Arm **10** is connected to swing pipe **8** by means of a ball joint **12** with journal **11**, and arm **10'** is connected to the cable bridge **15** of the furnace through a ball pivot **16**. The fork joint **13** is illustrated in detail in FIG. 6, and the ball joint on the cable bridge is shown in FIGS. 4 and 5. There, the spring elements **14** are indicated which diminish the inertia forces in case of possible shock-like movements.

As has been mentioned, the arrangement can also be kinematically reversed, that is to say that the ball joint may be provided on the cable bridge and the flexible journal connection may be provided on the swing pipe.

What we claim is:

1. A waste gas main for tiltable electric furnaces, comprising a waste gas socket in the furnace cover, a waste gas conduit having a mouth for receiving waste gases from said socket, means supporting said waste gas conduit for slewing movement in a horizontal plane and an articulated linkage interposed between and connecting the slewable waste gas conduit and the tiltable furnace for guiding said waste gas conduit so that the mouth thereof is positioned vis-à-vis to the mouth of the waste gas socket in any position of said tiltable electric furnace in order to take up the waste gases.

2. A waste gas main as set forth in claim **1**, wherein the articulated linkage comprises a first arm, a ball joint securing one end of said first arm to said furnace, a second arm, means securing one end of said second arm to said slewable waste gas conduit and a fork joint connecting the opposite ends of said arms to each other.

3. A waste gas main as set forth in claim **1**, wherein the articulated linkage comprises a first arm, a ball joint

connecting one end of said first arm to the slewable waste gas conduit, a second arm having one end secured to said furnace and a fork joint connecting the opposite ends of said arms to each other.

4. A waste gas main as set forth in claim 1, wherein the articulated linkage comprises a first arm, a ball joint securing one end of said first arm to said furnace, a second arm, means securing one end of said second arm to the slewable waste gas conduit, a fork joint connecting the opposite ends of said two arms to each other and spring elements in said ball joint.

5. A waste gas main as set forth in claim 1, wherein the articulated linkage comprises an arm, a ball joint securing one end of said arm to the slewable waste gas conduit, a second arm secured at one end to said furnace, a fork joint connecting the other ends of said arms to each other, and spring elements in said ball joint connecting said arm to said waste gas conduit.

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FREDERICK L. MATTESON, JR., *Primary Examiner.*

JOHN J. CAMBY, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,358,978 December 19, 1967

Josef Lambrecht et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, line 10, for "A 7,574/64" read -- A 7,575/64 --.

Signed and sealed this 22nd day of April 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents