

# PATENT SPECIFICATION (11) 1 582 497

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## (54) IMPROVEMENTS IN OR RELATING TO STEEL PRODUCTION

(71) We, HOESCH WERKE AKTIENGESELLSCHAFT, of Eberhardstrasse 12, 4600 Dortmund 1, Germany, a German Company do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to steel production and in particular to steel production in a converter.

In steel production by the converter process, the whole of the energy necessary for the completion of the metallurgical reactions is usually provided exclusively by the heat of reaction. Consequently the amount of charging material which can be charged into the converter in solid form is limited. Thus in a top-blowing converter, up to about 30% of the total charge can normally be charged as cold scrap.

There are however considerations, particularly economic considerations, which make a larger cold charge desirable in steel production by the process. To that end, scrap-preheating has been proposed, either in the refining vessel itself or before charging. These known measures for increasing the cold charge are however, unsatisfactory. Preheating in the refining vessel itself is chargeable to the throughput. In the case of preheating outside the refining vessel considerable heat losses through radiation must be taken into account, and furthermore the course of operation is impaired.

It has also been already proposed to preheat the blast air in converter operation by making use of the waste heat from the converter waste gases (German Patent 824 791) but the ways suggested for doing it, namely, the preheating of the air in heat-exchangers or by heat storage, prove in practice to be economically unfeasible because of the waste gases developed are

heavily charged with dust and particles of slag.

The present invention is concerned with the preheating of the gaseous oxygen supply medium, that is, blast air or blast oxygen, in a manner which can not only be readily achieved in practice but which is also economical.

The invention according provides a method of steel production in which a gaseous oxygen supply medium is supplied to a converter through a heat exchanger to which steam is supplied as a heating medium.

The invention also provides apparatus for steel production, the apparatus comprising a converter, a supply line for supplying a gaseous oxygen supply medium to the converter, the supply line extending through a heat exchanger, and a source of steam connected to the heat exchanger for the supply thereto of steam as a heating medium.

Steam is usually available in adequate amounts in the input or entry region of a steelworks, from steam generating a plant included in the steel or ironworks. The steam is substantially free of foreign matter and is an ideal heating medium for the purposes of the invention, because the functioning of the heat transfer unit to which it is supplied and in which the gaseous oxygen supply medium is preheated, remains unimpaired. With steam as the heat carrier, the transmissible heat supply, composed of the sensible heat of the steam and the heat of condensation of the steam, proves advantageous in other respects. By preheating the air or oxygen supply in accordance with the invention, there is obtained moreover an economically advantageous and practically achievable utilization of waste heat from the refining process itself. The waste gas chimneys of modern steelworks are cooled, so that steam is de-

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veloped. This steam, which is otherwise allowed to escape unused can be made use of practically and economically in accordance with the invention.

5 Where a steelworks includes a plurality of refining vessels which as a rule are operated at staggered intervals, it is advantageous to provide a connection between the waste gas steam pipes. In a further refinement, a  
10 connection is provided with the steam piping of other steam generators disposed in the entry region of the works.

Preheating in accordance with the invention requires comparatively low investment costs and its operation is practically maintenance free. Because of the high heat supply available through the preheating of the gaseous oxygen supply medium, the invention makes it possible to increase the cold charge with constant tap weight.

20 Furthermore, in the case of bottlenecks in the pig iron supply, by increasing the charge of scrap, more raw steel can be produced in the steelworks by the invention, that is, the smelting capacity can be increased.

25 Preferably the heat transfer from the steam to the gaseous oxygen supply medium is effected by means of a heat-exchanger which is located in the piping admitting oxygen to the blast lance where the oxygen top blowing method is employed. Preferably the heat exchanger is located between the blast lance and shut-off and regulating devices in the supply line for the gaseous oxygen supply medium.

30 By way of illustration, an apparatus embodying the invention is diagrammatically shown in the single figure of the accompanying drawing.

40 The illustrated apparatus comprises a heat exchanger 11 which is inserted in piping 12, 12' by which oxygen is admitted into a blast lance 13. The arrows A and B indicate the direction of flow of the steam, as a heat carrying medium, through the heat-exchanger 11. The portion 12' of the piping which functions as connection piece between the heat exchanger 11 and the lance 13 is thermally insulated.

#### 50 *Example*

In a practical application of the illustrated apparatus, 12600 Nm<sup>3</sup>/hour of oxygen at a pressure of 18 bars, flowing through the  
55 heat-exchanger 11, are fed through the piping to the blast lance 13. At the same time steam at the rate of about 7 tons/hour at 220°C and 25 bar is fed to the heat-exchanger 11. In this way, the oxygen flowing through the heat exchanger 11 is preheated to about 210°C. As a consequence, it was possible to increase the cold charge by about 5%.

#### WHAT WE CLAIM IS:-

65 1. A method of steel production in

which a gaseous oxygen supply medium is supplied to a converter through a heat exchanger to which steam is supplied as a heating medium.

2. A method as claimed in claim 1 in which the steam is generated by waste gas developed in the refining process. 70

3. A method of steel production substantially as herein described in the Example. 75

4. Apparatus for steel production, the apparatus comprising a converter, a supply line for supplying a gaseous oxygen supply medium to the converter, the supply line extending through a heat exchanger, and a source of steam connected to the heat exchanger for the supply thereto of steam as a heating medium. 80

5. Apparatus as claimed in claim 4 wherein the heat exchanger is located between a blast lance and shut-off and regulating devices in the supply line. 85

6. Apparatus as claimed in claim 4 or 5 wherein the supply line is thermally insulated downstream of the heat-exchanger. 90

7. Apparatus as claimed in claim 4, 5 or 6 wherein the source of steam comprises a steam generator deriving heat from waste gas.

8. Apparatus for preheating the gaseous oxygen supply medium in steel production substantially as herein described with reference to the accompanying drawing. 95

(POLAK MERCER & TENCH), 100  
Chartered Patent Agents,  
High Holborn House,  
52-54 High Holborn,  
London WC1V 6RY.  
and 105  
Eastcheap House,  
Central Approach,  
Letchworth,  
Hertfordshire SG6 3DS.  
Agents for the Applicants. 110

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of the Original on a reduced scale*

