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APPARATUS FOR DECARBURIZING STEEL

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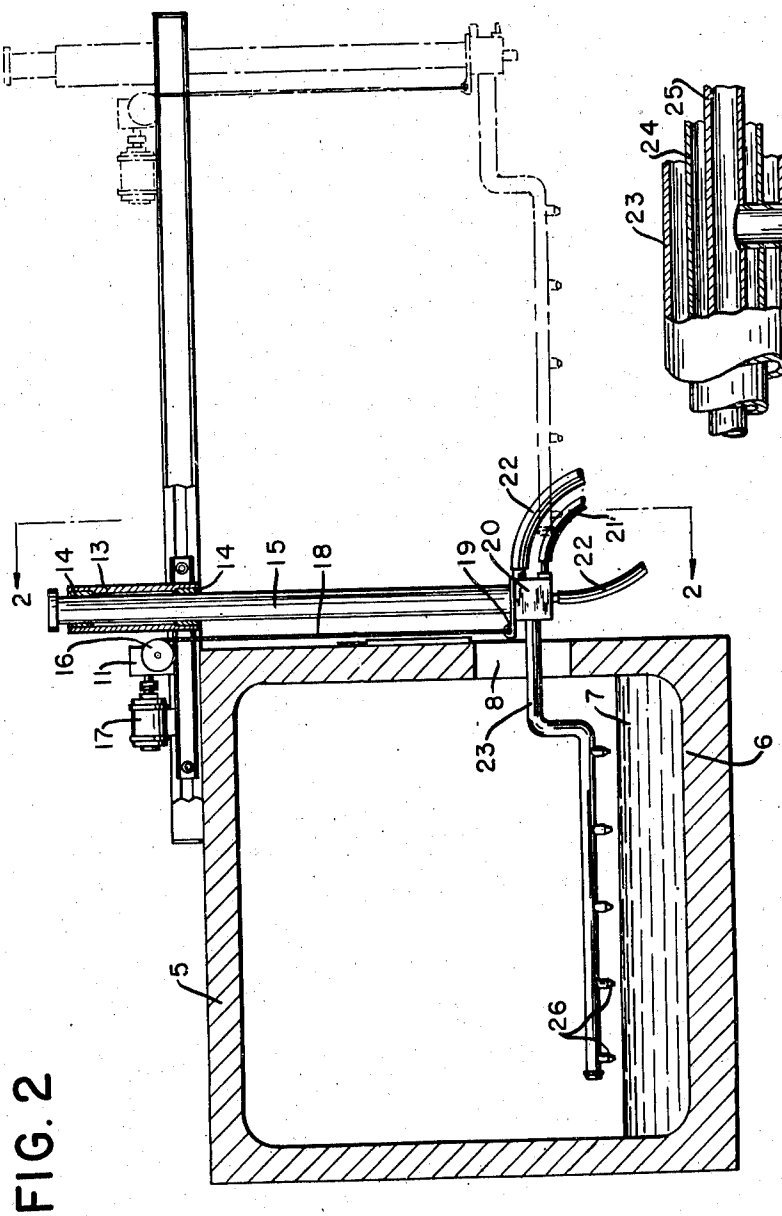
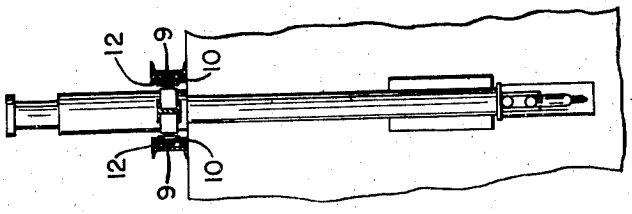


FIG. 2

FIG. 3

FIG. 1



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APPARATUS FOR DECARBURIZING STEEL

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1 Claim. (Cl. 266—34)

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This invention relates to the decarburizing of steel in the manufacture thereof and particularly to an improved apparatus for introducing oxygen to molten metal.

In a co-pending application Ser. No. 728,868, I have described a method of decarburizing steel by introducing oxygen beneath the surface of the molten metal. In that application, a pipe, which is gradually consumed, is introduced manually through the charging opening of the furnace. More than one pipe may be employed, particularly after the carbon content has been partially consumed, in order to facilitate dissemination of the oxygen through the molten metal. The work of handling pipes under the conditions of operation is arduous, although the method is entirely practicable and has been utilized successfully in the commercial production of steel.

It is the object of the present invention to provide a simple, effective and easily handled apparatus for introducing oxygen to molten metal.

A further object of the invention is the provision of an apparatus whereby oxygen may be supplied simultaneously at a plurality of areas in the molten bath.

Other objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and the accompanying drawing, in which

Fig. 1 is an elevation, partially in section, showing the application of the apparatus to a metallurgical furnace;

Fig. 2 is a section on the line 2—2 of Fig. 1; and

Fig. 3 is an enlarged section of the manifold through which oxygen is supplied to the individual oxygen nozzles.

Referring to the drawing, 5 indicates generally a furnace structure having a hearth 6, in which a bath 7 of molten metal is maintained. Suitable heating means (not shown) may be provided to maintain the metal in the molten condition. The furnace is provided with a charging opening 8. It will be understood that the exact construction of the furnace forms no part of the present invention, which may be applied to furnaces of various types.

Supported on the roof of the furnace is a track consisting of a pair of spaced channel members 9 with track members 10 secured to the inner flanges thereof. The channels 9 project forwardly from the furnace for a sufficient distance to permit the operation of the apparatus in the manner hereinafter described.

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A carriage 11 is provided with wheels 12 cooperating with the track members 10 so that the carriage may move toward and away from the furnace opening 8. On the carriage, a vertical tubular member 13 is provided with bearings 14 to support a member 15 which is vertically adjustable in the bearings. A winch 16 is supported on the carriage 11 and is adapted to be driven by a motor 17. A cable 18 extends from the winch to a connecting member 18 near the bottom of the member 15. Thus, by operating the winch, the member 15 may be moved vertically in its bearings.

At the lower end of the member 15, a terminal block 20 is provided with a connection 21 through which oxygen from any suitable source may be supplied. Connections 22 permit the introduction and withdrawal of a cooling fluid such as water. Projecting inwardly from the terminal block 20 is a pipe 23 enclosing pipes 24 and 25. The latter receives a supply of oxygen from the connection 21. Between the pipes 23, 24 and 25, are spaces through which the cooling medium circulates in order to prevent overheating when the pipe 23 is in the furnace 5. Projecting downwardly from the pipe 23 are a plurality of pipes or nozzles 26 which are connected to the inner pipe 25 so that the oxygen is delivered to the molten metal 7 beneath the surface thereof when the ends of pipes 26 are submerged therein, or delivered in the form of high velocity jets when the injection nozzles are supported above the bath.

The operation of the apparatus will be readily understood. When the member 15 is raised sufficiently so that the extension of the pipe 23 clears the charging opening 8, the entire apparatus may be moved away from the furnace as indicated by the dotted lines. When the apparatus is to be used, it is first moved into the furnace to the position indicated by the full lines. The oxygen from any suitable source is delivered through the pipe 25 and nozzles 26, and the carbon content of the molten metal is promptly consumed by oxidation. When the decarburizing operation is concluded, the apparatus is again withdrawn from the furnace. Although oxygen of commercial purity, that is 99.5% or better is most suitable for the purpose, it is not essential. Oxygen of purity range from 45% to 99.5% or better may be utilized successfully for the purpose of the present invention. The reaction is slower with lower grades of oxygen, but nevertheless the carbon may be consumed effectively and more satisfactorily with

respect to certainty of results than by the method as heretofore commonly practised, in which iron ore is added as an oxidizing agent to eliminate carbon.

The apparatus as described is simple and useful. It does not interfere with operations on the charging floor because when it is not in use the member 15 can be raised sufficiently so that the pipe 23 and the extension thereof are elevated to a point near the top of the furnace. The raising and lowering, as well as lateral transfer of the apparatus, is easily handled. Since the oxygen is discharged through a plurality of nozzles, dissemination of the oxygen through the molten metal is improved and rapid decarburization is accomplished even after the carbon content has been partially reduced.

Various changes may be made in the structure of the apparatus as described without departing from the invention or sacrificing the advantages thereof.

I claim:

In a metallurgical furnace, apparatus for introducing oxygen into molten metal is the furnace comprising a track mounted on the furnace above the charging door thereof and projecting beyond the furnace at one side, a carriage movable along said track, a depending member supported by the carriage, a conduit for gas supported by the depending member and projecting therefrom in a direction toward the furnace, a water jacket surrounding said gas conduit, and means for vertically adjusting the depending member relative to the carriage, whereby the conduit for gas may be positioned vertically to be brought into alignment with the charging door and moved into and out of said door, and when outside of said door may be moved upwardly and away therefrom.

GEORGE V. SLOTTMAN.

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