

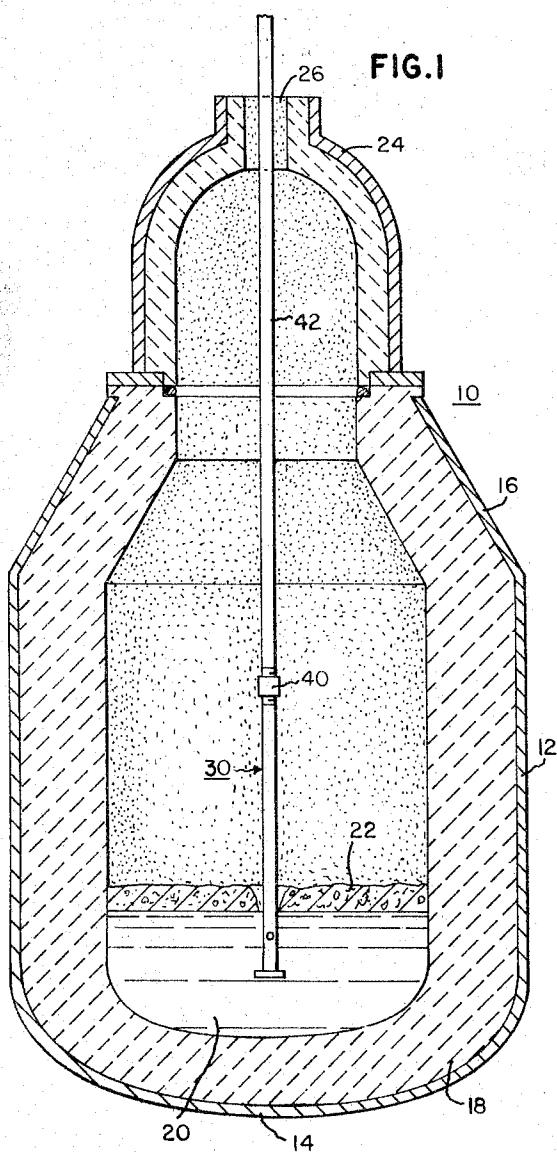
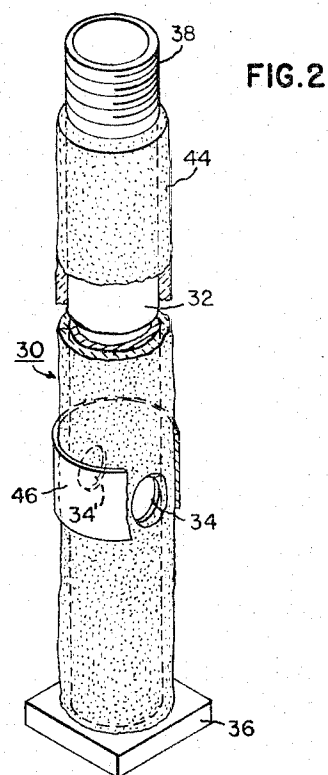
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SAMPLER

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1

3,298,069
SAMPLER

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4 Claims. (Cl. 22-210)

This invention relates to a device which is suitable for use in obtaining a sample of molten metal, and in particular to a device which is suitable for use for obtaining a sample of molten metal during the blowing of a heat of steel in a basic oxygen converter.

Heretofore it has been necessary for the operator of a basic oxygen converter to interrupt the melting process in order to obtain a sample of the molten metal contained within the bath. This necessitated the interruption of the flow of the oxygen, withdrawing the lance, tilting the vessel, sampling the bath by conventional methods, returning the vessel to an up-right operation, re-inserting the lance and then continuing with the oxygen blowing. When this prior-art method of sampling is used, the normal processing is interrupted, consequently an increase in the heat time occurs with a consequential increase in cost. Moreover, it has been found that heats in which the oxygen blow has been stopped or the oxygen blow has been interrupted for various reasons and then have been reblown, have resulted in considerably lower yields being obtained from the same heat of steel. These lower yields are caused by excessive metallic oxidation during the reblowing period. The problem created by interrupting the blow becomes even more acute when the character of the steel being manufactured is that known in the trade as a stainless steel. Stainless steels, for example those produced in accordance with the teachings of the co-pending application of Richard B. Shaw, application Serial No. 290,299, are blown with oxygen in order to reduce the carbon content to the desired low level. Control of the process is based upon the chemical analysis of the molten metal bath during such blowing operation. Consequently, when decarburization is stopped and the sample obtained by conventional methods, excessive oxidation of chromium content of the metal bath occurs with the result that either the chromium values are quite low or excessive amounts of reducing agents must be utilized to reduce the oxidized chromium from the slag.

In order to alleviate these conditions, the sampler of the present invention has been utilized with great success for obtaining a sample of the metallic bath without interrupting the flow of oxygen thereto. It has been found that the use of such sampler for obtaining a sample of the molten metal contained within the basic oxygen converter during the blowing thereof is a highly significant tool for use in controlling the overall quality of the basic oxygen furnace melting process.

An object of the present invention is to provide a sampler which is suitable for use in obtaining a sample of a molten metal during the refining thereof.

A more specific object of the present invention is to provide a sampler which is suitable for use in obtaining a sample of the molten metal bath of a heat of steel in a basic oxygen converter without interrupting blowing.

These and other objects of this invention will become apparent to one skilled in the art when read in conjunction with the following description and the drawings and in which:

FIGURE 1 is a schematic illustration of a basic oxygen converter showing the sampler in place; and,

FIG. 2 is a schematic view showing a typical sampler.

Referring now to the drawings and to FIG. 1 in particular, a basic oxygen converter is illustrated generally at 10 and comprises a shell formed from a substantially

2

vertically extending side wall 12, integral bottom 14 and terminating at the upper portion of the sidewall in a constricted neck 16 so that the general shape of the converter assumes that of a squat bottle. Preferably, the converter 10 is provided with an interior refractory lining 18 which is disposed to cover the bottom 14, side wall 12 and neck 16 and extends a predetermined distance inwardly and defines the confines for a metallic bath 20 having a slag covering 22 contained thereon. The converter is also provided with an exhaust hood 24 having a suitable opening 26 contained therein for facilitating the entry of the sampler shown generally at 30 within the interior of the converter 10. Usually the hood 24 is water cooled and serves to remove the exhaust fumes and has an additional opening (not shown) for accommodating an oxygen lance vertically downwardly therethrough.

Referring now more particularly to FIG. 2, the sampler shown generally at 30 comprises a vertically extending substantially hollow member 32 which is provided with ports 34 and 34' extending into the hollow interior thereof. The bottom end of the sampler 30 is provided with a chill plate 36 which is secured thereto and the upper end of said hollow member 32 terminates in means 38 which is suitable for facilitating the immersion of the sampler into the molten metal bath 20. The means 38 may be secured to immersion rod 42, for example by a collar 40 (see FIG. 1) to which is secured the upper end of the sampler 30. Thus, the immersion rod 42 carrying the downwardly depending sampler 30 which is secured thereto by means of collar 40, may be lowered into the metallic bath 30 through the opening 26 in the exhaust hood 24 by any suitable means, for example a cable and reel (not shown).

The sampler may be lowered through the opening 26 until the port 34 is below the slag level 22 and is in communication with the metallic bath 20 contained within the converter 10. In order to protect the sampler 30 during the period of its immersion in the metal bath, a refractory coating 44 is disposed to encase the sampler and in order to prevent the pick-up of slag 22 within the hollow interior of the sampler, expendable means 46 is disposed to cover the port 34 when the sampler is immersed through the slag cover. Conveniently, the expendable means 46 may be formed of aluminum foil which can be dissipated into the molten metallic bath upon contact of said aluminum foil with said molten metal bath.

In operation, the sampler 30 is provided with chill plate 36 which is welded to the bottom of the substantially vertically extending hollow member 32 and the hollow member 32 in the embodiment illustrated may conveniently terminate in the threaded portion shown for example at 38. The sampler is thereafter covered with a refractory compound 44 so as to encase the complete sampler including the chill plate 36. While it is not necessary to encase the chill plate 36 with refractory compounds, no special precautions are employed to prevent the same while encasing the sampler in the refractory compound. Thereafter, expendable means 46, for example, aluminum foil, is wrapped about and covers the port 34. As thus assembled, the sampler 30 is secured to the immersion rod 42, for example by means of a collar 40. While the oxygen lance is blowing the melt contained within the converter 10, the sampler 30 is admitted to the converter 10 through the opening 26 contained in the exhaust hood 24. The cable and reel (not shown) can lower the immersion rod 42 a predetermined distance which can be determined externally of the furnace. The sampler is dipped into the melt to said predetermined amount and immediately retracted. During the said dipping operation the expendable means 46 permits the port 34 to remain closed until said port is within the metallic bath whereupon said expendable means 46 is dissipated within the

3

molten metallic bath 20, the molten metal enters the port 34 and upon retraction of the sampler from the bath, a predetermined amount of metallic sample is obtained which can be severed, for example, by sawing the sample in two and obtaining a substantially cylindrical metallic sample suitable for use in the chemical analysis as determined for example by a quantometer. Such metallic sample thus obtained can be employed for obtaining the information necessary to computerize the entire melting and refining operation. In practice, two of the ports 34 and 34', disposed in aligned relation on opposite sides of the sampler 30, are utilized to permit a fast access of molten metal into the sampler 30, both ports being temporarily closed or covered by the expendable means 46 until the sampler 30 is immersed in the molten metal.

I claim:

1. A sampler suitable for use in obtaining a metal sample without interrupting the blowing of a heat of steel in a basic oxygen converter, comprising a hollow member terminating at one end in a chill plate and having means disposed at the opposite end for facilitating the lowering of the sampler into the bath, said member being provided with at least one port intermediate said chill plate and said facilitating means and disposed for communication with the hollow interior of the member and a protective refractory coating disposed to cover the exterior of the sampler.

2. A sampler suitable for use in obtaining a metal sample without interrupting the blowing of a heat of molten steel in a basic oxygen converter, comprising a longitudinally extending hollow member terminating at one end in a chill plate and having means disposed at the opposite end for facilitating the lowering of the sampler into the bath, said housing being provided with at least one port intermediate said chill plate and said facilitating means and disposed for communication with the hollow interior of the housing, a protective refractory coating dis-

4

posed to cover the exterior of the sampler, and expendable means disposed to cover said port and become dissipated within the molten steel when the sampler port is positioned within the metal bath.

3. A device suitable for use in obtaining a metal sample without interrupting the blowing of a heat of steel in a basic converter comprising, a vertical longitudinally extending hollow member having a port contained therein disposed in communication with the hollow interior, a chill plate secured to the bottom end thereof, and means disposed to be secured to the top of the hollow member for facilitating the immersion of the sampler into the metallic bath, said port being disposed intermediate said chill plate and said facilitating means.

4. A device suitable for use in obtaining a metal sample without interrupting the blowing of a heat of steel in a basic oxygen converter comprising, a vertically extending substantially cylindrical hollow member having a port contained within said hollow member and extending in communication with the hollow interior thereof, a square chill plate secured to the bottom of the hollow member, means secured to the top of the hollow member for facilitating the immersion of the sampler into the metallic bath, said port being disposed intermediate said chill plate and said facilitating means, and a refractory coating disposed to cover the exterior of the sampler.

References Cited by the Examiner

UNITED STATES PATENTS

2,753,893	7/1956	Brown	138—145
3,019,496	2/1962	Bigge	22—209
3,163,897	1/1965	Sylvester	22—69
3,236,103	2/1966	Kooken	73—421

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