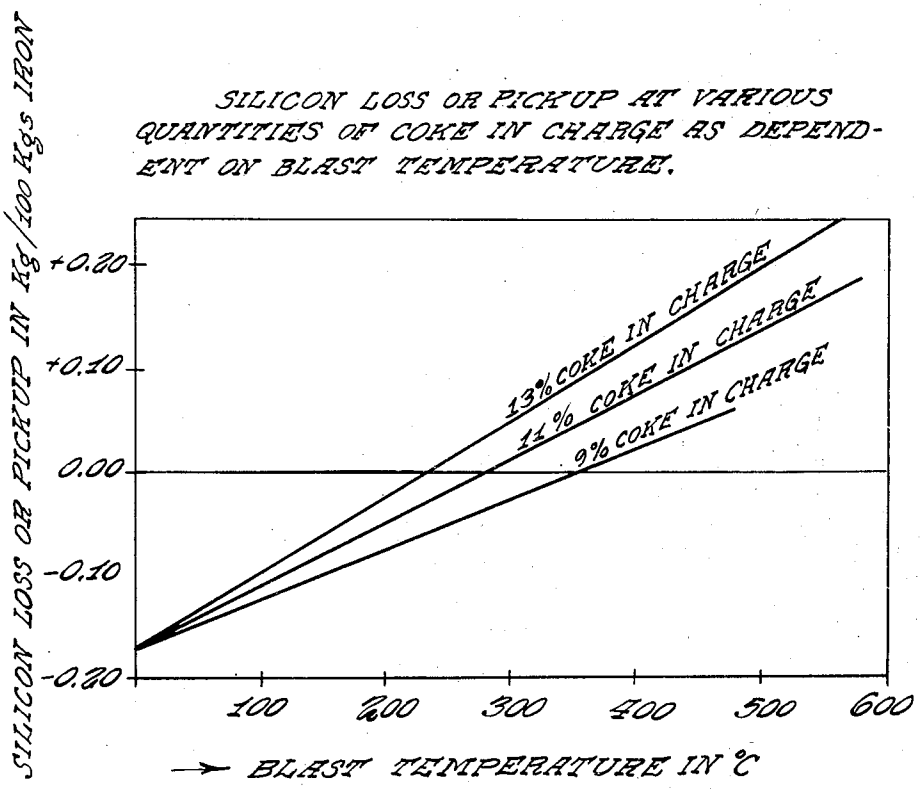
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PROCESS FOR OPERATING A MELTING SHAFT FURNACE

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PROCESS FOR OPERATING A MELTING SHAFT FURNACE

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The present invention relates to a process for operating a melting shaft furnace.

One of the known disadvantages of the conventional melting operation of a shaft furnace for the production of cast iron consists in the loss of considerable amounts of silicon from the charge due to oxidation, since the silicon passes into the slag. The amount of silicon lost in the usual operation of a furnace of conventional design is about 10% of the amount in the charge. The loss must therefore be compensated for by a correspondingly higher amount of silicon in the charge. This is a serious economic disadvantage because silicon is a very expensive alloy material.

It is old to operate a cupola furnace with a preheated blast; however, only recently has this so-called "hot blast cupola furnace" been introduced into practice. What is achieved by the operation of this furnace is, first of all, a decrease in the consumption of coke and an increase in the temperature of the liquid iron. Although it has been observed that the silicon loss (by burning) decreases as the blast temperature increases, and may finally even amount to a silicon gain, resulting in a silicon content in the iron higher than expected, this observation has not been followed up and advantage has not been taken of the findings for a change in the melting operation of the shaft furnace or the cupola furnace.

Further studies have shown that the preheating of the blast alone is not sufficient to obtain a definite silicon pickup in the iron melt in a stable amount, as is required for operational reasons.

Furthermore it has been found that the silicon loss or pickup in the melt is definitely dependent on the degree of the blast temperature.

The present invention is based on these findings and utilizes further conditions of the cupola furnace operation, such as the influence of the furnace lining and of the slag, on the course of the melting process.

According to the invention, then, a process for operating a melting shaft furnace is carried out wherein the charge for producing cast iron is made up with a lower silicon content than that of channel iron (i. e. of iron obtained in the tap spout of a cupola furnace), the deficit in silicon being compensated for by introducing it into the iron melt from the slag which is maintained at a constant and considerable height. The blast temperature is maintained all the time at such a temperature level that an increased combustion temperature will result.

Channel iron obtained, as mentioned above, by tapping a cupola furnace has varying contents of Si: in an ordinary grey cast, as it is used for machine parts, the usual Si-content is about 2% Si. However, for other purposes, the channel iron of a cupola furnace may have other

Si-contents and it should be understood that the present invention is applicable for obtaining such cast iron, too.

For carrying out the process, a furnace may be used which is provided in the usual way with an acid lining and operated continuously by the fore-hearth process. The temperature of the blast is preferably above 300° C.

By using the process according to the invention, it has been discovered that the amount of silicon lost by burning is dependent on the temperature of the blast, in such a way that the loss decreases with rising temperature. When the temperature of the blast is 300° C. and above, silicon is no longer lost by burning and upon further increase of the blast temperature a silicon pickup can be noticed.

In the accompanying drawing a chart is given showing the dependence of silicon loss or pickup on the blast temperature. The lines plotted in the chart are the result of tests performed at different blast temperatures. In these tests, the slag in the furnace was maintained at a certain height; with a ratio of lime and silicic acid of 0.7, the slag should be at a height of about 250 mm. In this case, the iron is capable of taking up from the slag an amount of silicon which corresponds to the one shown in the line of the chart. The 3 different lines there shown indicate the course at different charges of coke. Under the given conditions, the change-over from silicon loss to silicon pickup occurs at about 300° C. blast temperature.

Since the operation requires a channel iron of uniform silicon content, the height of the slag in the furnace has to be maintained at a constant level. As previously mentioned, the silicon pickup at higher blast temperatures also depends on the height of the column of slag in the furnace. Whenever the slag is tapped, the silicon pickup decreases. When it is intended to have a constant silicon content of 2% in the channel iron, such content may be obtained according to the invention, with the above mentioned ratio of lime: silicic acid at 0.7, by heating the blast to about 500° C. and maintaining the slag column in the furnace at about 250 mm. Under these conditions, the charge of silicon will only have to be 1.8 kgs. Si per 100 kgs. iron. This amounts to a saving of 0.4 kg. Si per 100 kgs. iron, considering the fact that in order to obtain a channel iron of 2% silicon content in a conventional process, the amount of silicon added in the charge had to be 2.2 kgs. per 100 kgs. iron in view of the loss in silicon of 10%.

The advantages of the process according to the invention consist chiefly in the saving of silicon in the charge and in the uniform quality of the resulting iron as regards its silicon content.

It should be understood that the figures in the example above described are given by way of illustration only. A satisfactory iron with the desired silicon content can also be obtained with variations in the blast temperature, the composition of the slag, the height of the slag in the furnace, and the silicon content in the initial charge, providing that these values are adapted in accordance with the dependence shown in the attached chart.

What I claim is:

1. A process for producing cast iron of a silicon content of about 2%, which comprises making up an iron-silicon charge adjusted to 1.8 kgs. Si per 100 kgs. of iron, introducing the charge thus adjusted into a furnace with an acid lining, preheating the blast admitted to the furnace to a temperature of approximaely 500° C., while maintaining a slag formed at a substantially constant height of 250 mm. in the furnace, the slag being of a ratio

of lime: silicic acid 0.7, and compensating for the low amount of silicon in the initial charge by introducing additional silicon from said slag into the iron melt.

2. A process according to claim 1, wherein the discharge of iron and slag is carried out continuously.

3. A process for producing cast iron of a silicon content of about 2% from a charge with less than 2 kgs. Si per 100 kgs. of iron, which comprises making up an iron-silicon charge adjusted to an amount of less than 2 kgs. Si per 100 kgs. iron, introducing the charge thus adjusted into a furnace with an acid lining beneath a slag having a lime-silica ratio of 0.7, preheating the blast admitted to the furnace to a temperature of at least 300° C., whereby the combustion temperature in the furnace will be at a higher level than ordinary combustion temperature, maintaining the slag formed during the process in a column

of a substantial height, and compensating for the low amount of silicon in the initial charge by introducing additional silicon from said slag into the iron melt.

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