UNITED STATES PATENT OFFICE

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PROCESS OF MELTING AND DEOXIDIZING METALS AND ALLOYS

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In order to cast metals, for example copper alloys, gunmetal or the like, a melting process is commonly used, in which old metal and new metal are melted together in oil or like 8 furnaces without crucibles. It has long been known that during this process copper alloys especially take up oxygen thus forming oxides of the metals which dissolve in the molten bath. These oxides are, however, already present in higher or lower percentages in the ingredient materials. Hitherto the destruction of these harmful oxide-compounds has been attempted by means of phosphorus, manganese alloys, aluminum and a whole series of other metallic deoxidizing agents. These, however, are only partially effective. It is known that carbon has the greatest deoxidizing action on molten iron and steel containing oxygen. The present invention is based on these facts and consists in a process for melting and deoxidizing metals and metal alloys, in particular copper alloys, and including iron and iron alloys, in which oxygen compounds and carbon are added to the melting bath, in such proportions that the oxygen content of the oxygen compounds bears exactly or substantially the correct ratio to the carbon to produce carbon monoxide gas. This is effected by mixing first of all oxygen carriers such as CuO or ZnO or MnO₂, or FeO with coal-dust in such proportion that the oxygen content of the oxide carrier relative to the carbon content is in proportion to the combining weights for the formation of CO gas. A certain excess of coal is necessary according to the metallic oxide and the alloy employed owing to the unavoidable losses arising when introducing the mixture into the molten metal bath. It has nevertheless been proved that no carbonization takes place in connection with iron alloys.

The following reactions take place for example:

<table>
<thead>
<tr>
<th>Nature of</th>
<th>Oxide dissolved in melting</th>
<th>Solid deoxidizing agent</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper alloy</td>
<td>CuO</td>
<td>Cu₂O + (CO₂ + C)</td>
<td>Cu₂ + CO₂</td>
</tr>
<tr>
<td>Iron alloy</td>
<td>FeO</td>
<td>Fe₂O + (Fe₂O₃ + C)</td>
<td>Fe₂ + CO₂</td>
</tr>
</tbody>
</table>

The principle of the process is to remove the oxygen of the bath in the form of CO₂ gas which is insoluble in most melting baths.

The addition of the mixture of oxides and coal-dust to the melting bath in such relative proportion as to produce the unsaturated compound CO₂ is an essential feature. In this way any harmful excess of oxide or of coal is avoided. According to the metals in the bath only such substances are chosen as oxide carriers of which the reduction products produce no harmful effects when they come into contact with the molten metal. For example CuO should not be used for steel, nor iron oxide for copper, since Cu is harmful to steel and iron to copper.

A part of the detrimental properties especially of copper and copper alloys and also of other non-iron metals is due to material with dissolved carbon monoxide. If the deoxidizing agent according to the present invention is added to such material which cannot be determined either by a chemical or metallographic investigation the metal will become worse because more CO gas is formed in the melting bath. By means of a melt to which one of the deoxidizing agents is added it can be determined after the cooling whether the present metal was oxidiferous or metal with dissolved carbon monoxide.

With the presence of excessive carbon (dissolved carbon monoxide) coming from the smelting process, the harmful effect thereof is nullified by the oxide.

For copper alloys the smelting process is carried out practically as follows: If the ingots contain dissolved carbon monoxide gas, the melting bath must be oxidized. It is possible to obtain an approximately neutral mixture by mixing old material with ingots containing oxide or dissolved carbon monoxide gas or by mixing both kinds of ingots.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

A process for melting and deoxidizing metals and metal alloys selected from a group comprising iron, copper alloys, and iron alloys, which process consists in adding oxy-
gen compounds and carbon to the melting bath, in such proportions that the oxygen content of the oxygen compounds bears substantially the correct ratio to the carbon to produce carbon monoxide gas.

In testimony whereof I affix my signature.

WILHELM REITMEISTER.