This invention has for its object a process for extracting certain metals from their oxides and more especially a process for the production of zinc from its oxide.

In the processes used up to the present as is well known the reduction of metallic oxides is generally carried out by treatment in retorts heated externally. These retorts being made of refractory material the passing of the heat through the wall is effected under uneconomical conditions so that the consumption of coal per ton of metal produced is very high. The process forming the object of the invention is intended to avoid this disadvantage that is to say to obtain the reduction to metal of the metal compound treated under considerably more economical conditions allowing the quantity of coal used to be reduced to a minimum.

For this purpose the process forming the object of the invention consists essentially in treating the compound to be reduced in a fused metallic bath exerting at the same time the chemical and thermal actions necessary for obtaining the reduction of the treated body in the form of metal.

In carrying the invention into effect this bath is constituted by a fused iron bath completed if desired by the necessary reagent for causing the reduction or the decomposition of the oxide to be treated.

The invention will now be described by way of example as applied to the manufacture of zinc from oxide of zinc.

The oxide of zinc to be reduced is dropped into a molten iron bath containing carbon in solution intended to operate as a reducing agent for the oxide of zinc.

The molten iron bath containing the oxide of zinc is maintained at a temperature of about 1500° C. in such a manner that under the action of this source of heat the oxide of zinc is decomposed by reduction by means of the carbon contained in the bath and gives rise to the production of vapours of zinc and oxides of carbon.

The vapours of zinc produced are recovered in the ordinary manner and then condensed with a view to obtaining metallic zinc. As the reaction proceeds the iron bath cools and becomes impoverished in carbon. Simultaneously and incidentally a certain quantity of zinc oxide is reduced in the presence of the iron and gives rise to the production of zinc and oxide of iron. The oxide of iron produced, so far as it has not been reduced by the carbon in solution itself, remains in solution in the iron and is ejected with the slag arising from the impurities of the product treated. When the quantity of carbon in solution in the fused iron bath has thus been used it is necessary to regenerate the iron bath that is to say to supply it fresh with the necessary heat as well as with the indispensable reagent. For this purpose the bath having served for the reducing operation is transported to a furnace where it is heated and in which is added a fresh amount of reducing carbon and if desired the iron lost in the slag is also added so as to preserve the initial composition of the bath. The bath thus regenerated is then transported again to the reaction apparatus where the operation is recommenced by the introduction of oxide of zinc into the fused bath. Each operation comprises consequently two distinct phases:

1. The reducing phase during which the oxide of zinc received in the fused iron bath the necessary heat for its reduction as well as the reducing agent itself and
2. The regeneration phase during which the bath is re-heated to its initial temperature and the yield of carbon is brought back to its original percentage, the oxide of iron which may be formed being simultaneously reduced.

In practice the regeneration of the iron bath can be effected in various ways for example according to the principle of the Martin furnace where the iron is heated whilst the necessary carbon is added the heating being effected either by gases, or by the direct combustion of pulverized coal. This regeneration can however be also obtained according to the principles of the Thomas or Bessemer process by the injection of a mixture of air and carbon into the iron bath, the carbon being in excess in such a manner that a part of this carbon is burned and the surplus passes in solution into the bath.

It will be noted that the process described allows of transmitting the heat necessary for the reaction in a direct manner, without a refractory wall thus effecting the direct utilization of the produced heat, and of avoiding moreover to a great extent the losses of zinc which are produced in present day
metallurgy and finally of economizing considerably on the installation and operating expenses.

I claim:

1. The process of extracting zinc from its oxide compounds the said process comprising preparing a fused iron bath, adding carbon to the said bath, then treating in the said bath the zinc oxide compound at a temperature at which the vapor pressure of the bath is low and the vapor pressure of the extractive metal is high, whereby the reduction of the compound is effected in the said iron bath in the presence of the carbon contained therein.

2. The process of extracting zinc from its oxide compounds, the said process comprising preparing a fused iron bath adding carbon to the said bath, then subjecting in the said bath the zinc oxide compound to the chemical and thermal action of the said bath, whereby the compound is decomposed by reduction by means of the carbon contained in the bath, collecting the vapours of the metal which are evolved during the operation and finally condensing the said vapours, whereby the metal contained in the compound is obtained.

3. The process of extracting zinc from its oxide compounds the said process comprising preparing a fused iron bath, adding carbon to the said bath, then introducing in the said bath the zinc oxide compound, whereby the compound is decomposed by reduction, collecting the vapours which are evolved during the operation, condensing the said vapours, whereby the metal contained in the compound is obtained, and finally regenerating the iron bath.

4. The process of extracting zinc from its oxide compounds the said process comprising preparing a molten iron bath, adding a reducing agent to said bath, introducing a given quantity of zinc oxide compound into the said molten bath, maintaining the temperature of the bath at a temperature of about 1500° C. whereby the zinc oxide compound is decomposed, collecting the vapours of zinc which are evolved during the operation, condensing the said vapours whereby the metallic zinc oxide is obtained and finally regenerating the iron bath for the reduction of a new quantity of zinc compound.

5. The process of extracting zinc from its oxide compounds, the said process comprising a reducing step in a fused iron bath at a given temperature, the said bath containing a reagent capable of effecting a decomposition of the compound into metallic zinc and other products, maintaining the bath and zinc compound at a temperature which will cause a decomposition of the compound by said reagent and also vaporization of the metallic zinc as produced, and collecting and condensing said zinc vapor.

6. The process of extracting zinc from its oxide compounds, comprising adding the zinc oxide compound to a molten iron bath containing a reagent capable of effecting a decomposition of the compound into metallic zinc and other products, maintaining the bath and zinc compound at a temperature which will cause a decomposition of the compound by said reagent and also vaporization of the metallic zinc as produced, and collecting and condensing said zinc vapor.

In testimony whereof I have affixed my signature.

CHRISTIANUS JOSEPHUS GODEFRIDUS AARTS.