

UNITED STATES PATENT OFFICE.

CLAUDE VAUTIN, OF LONDON, ENGLAND.

PRODUCTION OF FUSED METALS AND ALLOYS FROM OXIDS, &c.

No. 837,160.

Specification of Letters Patent.

Patented Nov. 27, 1906.

Application filed August 23, 1905. Serial No. 275,459.

To all whom it may concern:

Be it known that I, CLAUDE VAUTIN, a subject of the King of England, residing at London, England, have invented certain new and useful Improvements in the Production of Fused Metals and Alloys from Oxids and other Compounds, of which the following is a specification.

This invention relates to improvements in the production of fused metals and alloys from oxids and other compounds, the object being to provide a substance which when mixed with metallic oxids, chlorids, &c., and ignited will give rise to a considerable evolution of heat, accompanied by the production of the metal or alloy.

Processes have hitherto been suggested for the production of metals from their compounds by mixing and igniting the latter with finely-divided metallic aluminium. I have now discovered that a similar result may be brought about in a more economical and efficient manner by mixing with the metallic compound to be treated a compound of a more electropositive metal with silicon and igniting the mixture. The electropositive metal is preferably an earth metal, such as magnesium or aluminium, so that magnesium silicide or aluminium silicide is then used as the reducing agent.

According to this invention an oxid, such as iron oxid, is mixed with one of these compounds or alloys and is ignited, when the silicides are converted into silicates and the metallic iron is produced in a fused state. Oxids, chlorids, &c., of other metals, such as chromium, may be similarly treated.

The reaction in the case of magnesium silicide can be represented as follows:

$4\text{Fe}_2\text{O}_3 + 3\text{Mg}_2\text{Si} = 6\text{MgO} \cdot 3\text{SiO}_2 + 8\text{Fe}$,
or in the case of aluminium silicide as follows:

$5\text{Fe}_2\text{O}_3 + 3\text{Al}_2\text{Si} = 3\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2 + 10\text{Fe}$.

The iron is produced in a molten condition at a temperature considerably above its melting-point, and is therefore particularly adapted for use in welding, in the mending of broken machinery, and the like.

As an example of one application of this invention the following is a description of the method of welding rails: A suitable mold is prepared and placed in position around the ends of the rails which it is proposed to weld or bond together, and into a crucible or similar

vessel is introduced an intimate mixture of finely-divided iron oxid and finely-divided aluminium silicide or borid or magnesium silicide or borid in such proportions that the iron oxid is slightly in excess of the quantity required by the equation expressing the reaction, so that the metallic iron resulting from the reaction shall be as free as possible from aluminium, magnesium, or silicon, as the case may be. The reaction is started by the application of a high temperature at any given point in the mixture in the crucible by any suitable means—say by a blowpipe-flame or any chemical reaction capable of producing the desired temperature, or by electric means, or in any other well-known way. The reaction when started proceeds throughout the mass without the application of any external heat, producing highly-heated metallic iron and a slag consisting of silicate or borate of alumina or magnesia. When the reaction is at an end, the molten iron is cast into the mold and onto or around the rail-joints to be welded, with the result that in consequence of the high temperature of the iron the rails which come into contact with the molten iron and the added iron itself become welded into one homogeneous and continuous rail.

When this invention is used for the reduction of iron oxid, as in the welding process just described, it will be found that after the reaction is over the contents of the crucible will consist of a layer of molten iron covered by a layer of slag, and according to the wish of the operator, guided by the class of joint, weld, or repair which is being made, the iron may be tapped from the bottom of the crucible or like vessel free from slag and run into the mold, and, if desired, the slag may follow on the top of the iron, (whereby the heat of the slag may in some cases be utilized to advantage,) or the slag may be removed from the surface of the molten iron by suitable means and the iron then poured over the lip of the crucible into the mold, or the slag may be poured first and then the iron, the method followed being decided by the circumstances.

Aluminium and magnesium form alloys or compounds with silicon containing various proportions of the constituents, and any of these compounds or alloys may be employed.

It is to be understood that the agent used to reduce the oxid of iron or the like, is not

magnesium or aluminium *per se*, but is a novel compound or alloy of one of these metals with silicon.

The details of the process may be varied without departing from this invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The herein-described process of producing fused metals and alloys from metallic compounds which consists in mixing said metallic compound with a compound of a more electropositive metal with silicon and igniting the mixture.

2. The herein-described process of producing fused metals and alloys from metallic compounds which consists in mixing said compound with a silicide of an earth metal and igniting the mixture.

3. The herein-described process of producing fused metals and alloys from metallic compounds which consists in mixing said compound with silicide of aluminium and igniting the mixture.

4. The herein-described process of produc-

ing fused iron from iron oxid which consists in mixing the iron oxid with a compound of a more electropositive metal with silicon and igniting the mixture.

5. The herein-described process of producing fused iron from iron oxid which consists in mixing the iron oxid with a silicide of an earth metal and igniting the mixture.

6. The herein-described process of producing fused iron from iron oxid which consists in mixing the iron oxid with silicide of aluminium and igniting the mixture.

7. The herein-described process of producing fused iron from iron oxid which consists in mixing powdered iron oxid with powdered silicide of aluminium and igniting the mixture.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLAUDE VAUTIN.

Witnesses:

HAROLD WADE,
HARRY B. BRIDGE.