

UNITED STATES PATENT OFFICE.

ROBERT H. AIKEN, OF WINTHROP HARBOR, ILLINOIS:

MAKING IRON FROM METALLIC SULFIDS.

No. 873,648.

Specification of Letters Patent.

Patented Dec. 10, 1907.

Application filed June 1, 1903. Serial No. 159,607.

To all whom it may concern:

Be it known that I, ROBERT H. AIKEN, a citizen of the United States, residing at Winthrop Harbor, in the county of Lake and State of Illinois, have invented certain new and useful Improvements in Making Iron from Metallic Sulfids, of which the following is a specification.

The general object of this invention is to provide a simple and inexpensive method for making steel or nickel steel directly from sulfid ores and sulfid mattes, and incidentally recovering, under certain conditions, metallic copper, or nickel, or alloys of one or both those metals.

The material operated upon is either raw ore, such as pyrrhotite or pyrite ores, or matte produced from the same. Advantage is taken of the fact that sulfur has a stronger affinity for iron than for copper or nickel. I have discovered that it requires but about four tenths of a volt to deposit nickel or copper from such compounds in a molten state while twenty five per cent higher voltage is required to deposit the iron from its sulfid. The total voltage must of course be enough greater than this to maintain the temperature and to overcome the resistance of the bath.

The material to be operated upon is fused by the electric current or preferably by more economical means such as a blast furnace, and while fused is electrolyzed until there is practically a complete separation of the copper or copper and nickel, according as the material contains one or both. These metals are so closely related to iron that a small quantity of the latter is usually deposited with them, but the loss of iron is slight and the small amount so deposited is readily eliminated in refining the copper or copper and nickel. When this part of the process is completed, the residual iron sulfid, after being segregated from the copper and nickel,

is electrolyzed under a higher voltage until its metal component is deposited at the cathode as iron.

Throughout the process the sulfur set free passes off at the anodes in gaseous form and it may of course be collected and utilized, in any well known way.

If the material operated upon be iron-copper sulfid, the first step constitutes a sub-process capable of producing practically pure copper directly from the ore or matte, and it is not material to this sub-process that the iron be recovered later.

The modification of omitting the segregation of the iron sulfid after the other metals have been thrown down causes all these metals to be deposited together, and if copper is present in small amount it has no deleterious effect and we have practically a very high grade nickel iron produced from the ore direct.

What I claim is:—

1. The process of producing iron from material containing the sulfids of iron, copper, and nickel which consists in fusing the material, electrolyzing the fused material, thereby depositing copper and nickel therefrom, segregating the residual material, and then electrolyzing said residual material to deposit the iron.

2. The process of producing iron from material containing iron and nickel sulfids which consists in fusing the material, electrolyzing the fused material until the nickel is deposited from its sulfid, removing the nickel, and further electrolyzing the residue until the iron is deposited from its sulfid.

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

ROBERT H. AIKEN.

Witnesses:

J. JEROME LIGHTFOOT,
WALLACE GREENE.