

UNITED STATES PATENT OFFICE.

ROBERT H. AIKEN, OF WINTHROP HARBOR, ILLINOIS.

PROCESS OF MAKING IRON FROM THE ORE.

No. 816,142.

Specification of Letters Patent.

Patented March 27, 1906.

Application filed June 1, 1903. Serial No. 159,609.

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 Processes of Making Iron from the Ore, of which the following is a specification.

This invention relates to producing iron from the ordinary oxid ores by first dissolving the oxid in a molten bath or slag and then decomposing the dissolved oxid and depositing the metal as iron by the action of an electric current.

I have found that under proper conditions iron oxid is readily dissolved in molten silicate of one or more of the metals not less electropositive than iron and that when so dissolved it is readily deposited by a moderate current of electricity. Excellent results are obtained by gradually feeding preferably pulverized Fe_2O_3 or Fe_3O_4 into a molten bath of FeOSiO_2 and maintaining a direct electric current through the mass. The addition of CaO , MgO or other oxid acting similarly lowers the fusing-point of the bath, aids solution, insures an advantageous basic character for the bath, and is therefore desirable though not indispensable. As much as twenty per cent. of Fe_3O_4 can be dissolved in basic silicate of proper constitution. The apparatus employed may be without novelty, the anode being preferably carbon or the like, the deposited metal serving as the cathode, and the comminuted material being stirred into the bath as the operation proceeds. The voltage is kept at the proper point during the operation—that is, it is made high enough to overcome the resistance of the bath and decompose the iron oxid held in solution—but not high enough to separate to any material extent the silicon or other more electropositive metals entering into the combination of the silicate. The temperature of the bath is maintained by supplying a current of the proper number of amperes per unit area for this purpose.

It is to be observed that this process is continuous and that the furnace may be very large, the latter point being important in that it permits economy in the matter of current.

If during the continuance of the current the supply of oxid be such that there is a deficiency in the bath, the electrically-low oxid of the silicate will be decomposed, provided, of course, that the voltage of the current be sufficiently high to decompose such oxid; but on the introduction of a plentiful supply of iron oxid the silicate will seize upon enough to make good the former loss. It is then quite possible to modify the process by supplying oxid at such a rate that the deposited metal will be taken from the silicate of iron already in the furnace in part, if not entirely, and perhaps with an acid silicate it may be practically possible to so far modify the process that there shall be absolutely no solution of the iron oxid in the silicate bath. In other words, it is possible to carry the process to the point where practically no iron remains in the silicate-bath provided that the bath contains other suitable bases, as before suggested. Such a course of procedure would not give a continuous process obviously. However, when the bath always contains a considerable amount of dissolved iron oxid and the electrolysis is practically a continuous process, the proportion of oxid contained at any given time may vary from a much smaller amount to about twenty per cent. of the silicate.

What I claim is—

1. The method of making iron from iron oxids which consists in dissolving the oxid in a molten silicate of one or more metals not less electropositive than iron, and passing through the solution a continuous current adapted to decompose said oxid.

2. The method of making iron from iron oxids which consists in forming a bath of molten silicate of one or more metals not less electropositive than iron; gradually feeding into said molten bath the oxid to be operated upon, and maintaining a direct electric current through the mass.

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.