

UNITED STATES PATENT OFFICE.

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PROCESS FOR THE TREATMENT OF ORES AND SOLID SALTS BY ELECTROCHEMICAL REDUCTION.

Specification of Letters Patent.

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1,285,690.

No Drawing.

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To all whom it may concern:

Be it known that I, ADRIEN ARMAND MAURICE HANRIOT, citizen of the French Republic, residing at Paris, Department of the Seine, in France, have invented certain new and useful Improvements in Processes for the Treatment of Ores and Solid Salts by Electrochemical Reduction; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

It is known to separate metals in a pure state from certain of their salts by treating the latter with an electric current. Thus, for instance, a great number of dissolved salts and some salts brought into the liquid state by fusion, may be subjected to the action of the current.

In all cases, however, where solid bodies have been treated electrolytically, compounds and alloys adapted to be used as anodes were only treated. Thus, for instance, electrolysis has been used in connection with the refining of lead and copper, and has permitted of obtaining chemically pure metals. In all these processes, however, the anodes were constituted by plates of an impure metal and the purified metal was conveyed to and deposited upon the cathode.

These processes are not all suitable for the treatment of solid salts. These cease being applicable as soon as the material to be treated cannot be used as an anode. This is the case with most insoluble and undissolved salts which constitute the major portion of natural ores, from which pure metals could not be extracted by the hitherto known electrolytical methods.

The present invention relates to an electrical treatment which, contrarily to the usual electrolysis, may be applied directly to an ore, and possesses, in comparison with the electrolysis, this other essential distinctive feature that the metal obtained instead of being conveyed through the bath from one electrode to another as in the known processes, remains in this bath at the place which was formerly occupied by the ore.

This process consists broadly in placing the ore or the solid salt to be decomposed, in a suitable conducting bath, in contact with the cathode, and in passing a current therethrough. The ore is converted into a

metal without any dissolution, and this metal takes the place of the ore.

The cathode is preferably constituted by a horizontal plate having an appropriate shape, upon which the ore is placed, the anode being of a neutral nature.

A few examples will follow, showing how the process may be carried into effect.

Example I: Silver chlorid is deposited upon a horizontal plate serving as a cathode, above which there is another horizontal plate forming the anode. The bath is constituted by a solution of carbonate of soda. A current at a low voltage, about 4 volts, is passed through the said bath. Under the action of the current, the ore is converted into a mass of metallic silver which remains on the cathode; the liberated chlorin is dissolved forming hypochlorite.

Example II: The galena also treated by a current at a low voltage, in the presence of diluted sulfuric acid is converted into metallic lead, while at the anode sulfur and hydrogen sulfid is obtained.

Example III: Malachite or copper silico-carbonate acted upon by the electric current under the same conditions, in a bath of potassium chlorid, will produce copper, remaining on the cathode, and carbonic acid and silica which will be found on the anode.

Example IV: Cinnabar is similarly converted into mercury and sulfur forming a little sulfureted hydrogen, in a bath containing sodium chlorid and a little carbonate of soda.

Generally speaking, the nature of the bath is of importance and in the case of certain ores it must be selected according to the nature of the ore in question, as it follows from the preceding examples.

It is obvious that the details of the execution of the process may vary without affecting the principle of the invention.

I claim:

1. The process of obtaining the metallic constituents from metalliferous materials, which consists in placing the metalliferous material in contact with the cathode in an electrolytic bath and passing an electric current through the bath, which current is of such voltage that the metalliferous material will be converted into pure metal at the cathode and a non-metallic constituent will be collected at the anode.

2. The process of obtaining lead from

lead-ore, which includes lead sulfid, which consists in placing the ore in contact with the cathode in an electrolytic bath, of dilute sulfuric acid and passing an electric current
5 of such density through the bath as to convert the ore at the cathode into pure lead and to cause the collection of sulfur at the anode.

In testimony whereof I affix my signature in presence of two witnesses.

ADRIEN ARMAND MAURICE HANRIOT.

Witnesses:

HANSON C. COXE,
ENRIK KLOP.

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