UNITED STATES PATENT OFFICE.

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PROCESS OF RECOVERING METAL FROM ALKALINE SOLUTIONS.

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To all whom it may concern:

Be it known that I, Henry R. Ellis, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Processes of Recovering Metals from Alkaline Solutions, of which the following is a specification.

In the patent granted me April 14, 1903, No. 725,548, I have described and claimed a process of extracting copper from its carbonate and oxid ores by using the carbonate or bicarbonate of soda or potash or mixtures as a solvent and afterward recovering the metallic copper by electrolysis or as a sulfid.

My present invention relates to the precipitation of the copper held in solution by the alkaline carbonates described.

In carrying out my process, I employ an amalgam of mercury with any one of the alkali metals, such as sodium or potassium, or of the alkaline-earth metals, such as calcium, or a combination of any two or more, or all of them. This amalgam may be used in the clear solution, or in the solution while the slimes of the ore are held in suspension by agitation. The amalgam may be used in a fine state of subdivision by spraying it into the solution, in which case the copper precipitates on the surface of the mercury particles and is amalgamated therewith. It is then settled out of the solution and the copper recovered in well known ways.

Another method of using the amalgam is to employ it as the positive element of an electrolytic couple, as illustrated in the drawing, which shows a vertical longitudinal section of an apparatus for carrying out this method. In this view A is a vat containing the copper charged solution, in the bottom of which vat is placed a body of amalgam B formed of mercury and one or more of the alkali metals, or alkaline-earth metals. Above the layer of amalgam are hung copper plates C, or copper filaments, or any conducting plates or filaments on which copper may be deposited. These plates or filaments have a wire D connecting them with the amalgam, thus causing the plates or filaments to become cathodes by forming an electrolytic couple.

When the copper charged solution is brought into contact with this combination, the greater part of the copper is deposited upon the plates or filaments in a pure state and a small part of the copper enters the amalgam. The copper is recovered therefrom by well known means.

It will be understood that in my former patent, No. 725,548, hereinafore referred to, the process therein described provides for the extraction of copper from carbonate and oxid ores by treating them with an aqueous solution of carbonate of soda or its described equivalent.

I am also aware that an amalgam of the alkalis or alkali earths has been used to precipitate gold and silver from cyanid solution, but this does not meet, nor anticipate the application of such amalgams to the copper solutions described which involve experiment and new chemical operations.

I claim:

1. The process of extracting and recovering copper from its carbonate or oxid ores or materials containing the carbonates or oxides of copper, which consists in subjecting such ores or materials to the action of a solution containing an alkali carbonate or bicarbonate as described, and precipitating the copper from such solution with an amalgam of any of the alkali metals or metals of the alkaline-earths, substantially as described.

2. The process of extracting and recovering copper from its carbonate or oxid ores or from materials containing the carbonates or oxides of copper, which consists in subjecting such ores or materials to the action of a solution containing an alkali carbonate or bicarbonate as described, and then precipitating the copper from such solution with a finely divided amalgam of any of the alkali metals or metals of the alkaline-earths, substantially as described.

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

HENRY R. ELLIS.

Witnesses,

George F. Watson,
A. C. Ellis, Jr.