No. 636,321. Patented Nov. 7, 1899.

T. CRANEY.

ELECTROMETALLURGICAL PROCESS OF EXTRACTING NATIVE COPPER.

(Application filed Nov. 30, 1898.)

(No Model.)

Fig. 1.

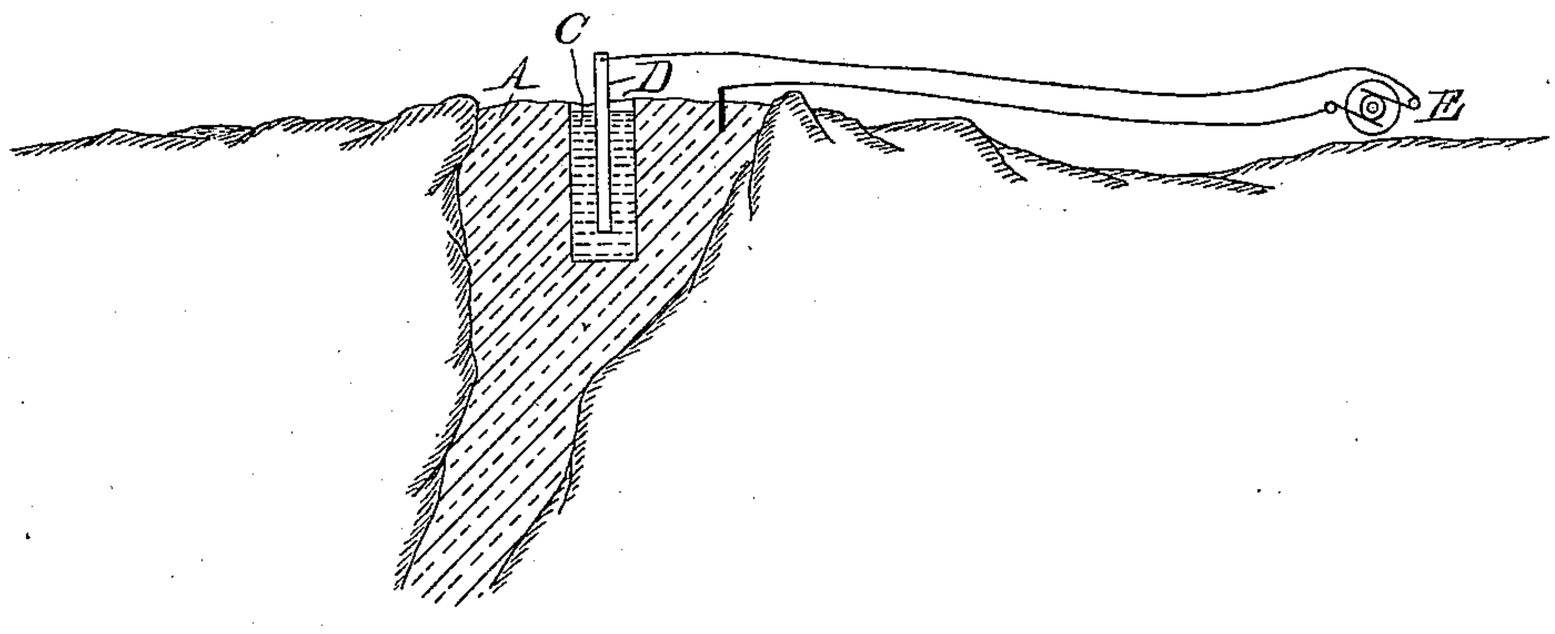
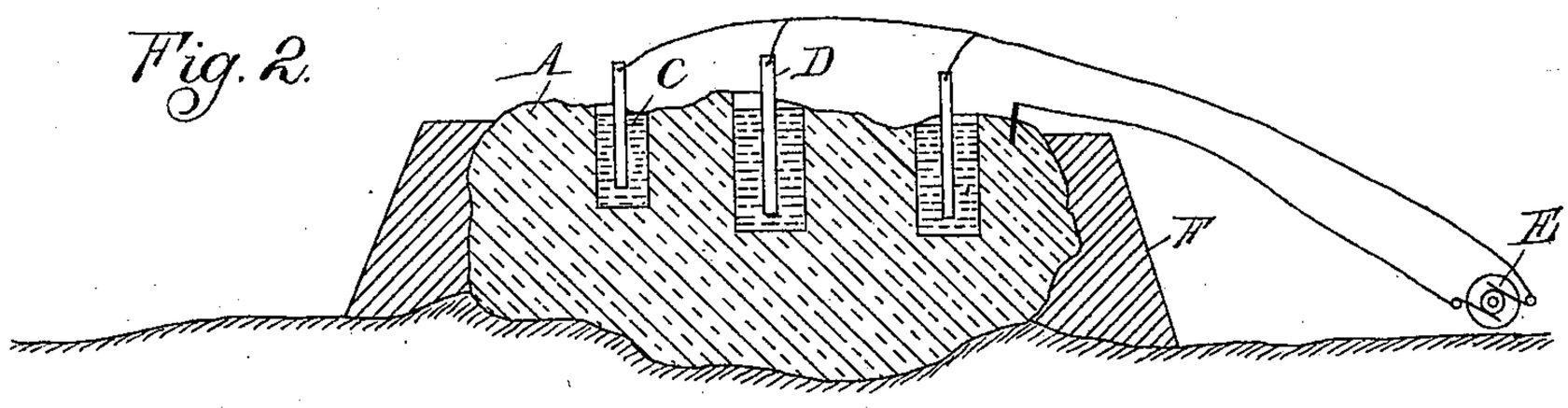


Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS CRANEY, OF BAY CITY, MICHIGAN.

ELECTROMETALLURGICAL PROCESS OF EXTRACTING NATIVE COPPER.

SPECIFICATION forming part of Letters Patent No. 636,321, dated November 7, 1899.

Application filed November 30, 1898. Serial No. 697,817. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS CRANEY, a citizen of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Electrometallurgical Extraction of Native Copper, of which the following is a specification, reference being had therein to the accompanying drawings.

It is well known that in the Lake Superior districts and adjacent copper regions native copper is frequently found in the form of large irregular masses embedded in rock fissures, and not unfrequently it is found in the form of large boulders. When it occurs in this form, it is now practically valueless, as the cost of mining or transporting such unwieldy masses to the smelters would be too great, considering the broken-up and rocky character of the country and the fact that the masses or boulders of native copper are generally dispersed over a wide area.

The object of my invention is to make this kind of native copper commercially valuable; and to this end my invention consists in extracting this copper directly where it is found by the application of the electrometallurgical process in the manner hereinafter described, and shown in the accompanying drawings in diagrammatic form.

Figure 1 illustrates the invention as applied to a mass of native copper inclosed in a rock fissure, and Fig. 2 shows it as applied to an exposed copper boulder.

Referring to the drawings, A represents an irregular mass of native copper, which may be inclosed in a fissure in the rock, as shown in Fig. 1, or which may be an exposed boulder, as in Fig. 2, and weighing, perhaps, from twenty-five to one hundred and fifty tons. In applying my process I expose the mass of copper at the surface, if it is covered up, and form a hole or cavity therein somewhere near the center. This cavity I fill with sulfuric acid C or with a mixture of sulfuric acid and a solution of sulfate of copper or with a solution of any suitable salt of copper and suspend therein a rod or small ingot of copper D in any suitable manner by which it is electrically insulated from the mass of the copper. I then employ a suitable generator of electricity E and electrically connect its positive pole to the mass of copper and its negative pole to the suspended copper rod, thus making the former the anode and the latter the cathode of an electrolytic cell. If the generator is then set in operation, it will be seen that the copper pertaining to the mass or body which is in contact with the electrolyte will be dissolved and be electrically deposited on the copper rod. The copper on the inside of the cavity thus continuously wears away, and in like measure the cathode increases by the constant deposition of pure copper upon it. After the cathode has attained a suitable size it may be replaced with a new cathode and the process continued in this manner till the whole mass of native copper is thus converted into a number of ingots of a size to be readily transportable and which consists of pure copper. As during the process the impurities in the native copper become deposited on the bottom of the cavity they may be readily removed and separately treated for the recovery of gold, silver, or other valuable metal often accompanying the native copper.

In the commercial application of my process I form as many cavities in the mass as convenient, each containing a cathode and forming as many electrolytic cells. In applying this process *in situ* I utilize the matrix in which the copper is inclosed as the outer vessel, so that even if portions of the copper walls of the cells should at any time become broken down it will not interfere with the work, and to this end if the matrix is perfect or if the mass of copper should not be or be only partially embedded in a natural matrix I completely incase it in a matrix F by applying clay or other suitable substance in a plastic state to the outside or, respectively, to the exposed portions of the mass of copper, which as it becomes hardened forms for itself or in connection with an original matrix a containing vessel in which the process of electrodeposition, as described, may be carried out until every portion of the native copper is recovered.

My process entirely overcomes the difficulties which heretofore prevented the mining of native copper where it occurs in isolated masses or boulders in a country where transportation is difficult and makes its recovery a commercial enterprise, as the whole plant required for its exploitation not only can be

easily transported from place to place, but by a suitable system of electrical distribution the current can be carried to otherwise inaccessible or to widely-separated locations.

What I claim as my invention is—

1. The herein-described process for mining native copper, where it occurs in isolated masses, or boulders, which consists in making the mass or boulder the containing vessel and anode of an electrolytic cell by first forming a cavity therein and then electrolytically depositing the copper upon a cathode in presence of a suitable electrolyte.

2. The herein-described process of mining native copper, where it occurs in isolated masses, or boulders, which consists in forming a cavity in said mass or boulder suspending a copper rod within said cavity and in electrolytically depositing the copper from the mass or boulder upon the copper rod, by constituting the copper rod, the cathode, and the mass or boulder, the anode of an electrolytic cell and the containing vessel for the electrolyte.

3. The herein-described process of mining masses or boulders of native copper, which consists in applying the electrometallurgical process of extracting the copper directly to the mass of copper *in situ* by forming a cavity in the mass itself and utilizing it as the containing vessel and anode of an electrolytic cell, a copper rod suspended in said cavity forming the cathode.

4. The herein-described process of mining masses or boulders of native copper, which consists in applying the electrometallurgical process of extracting the copper directly to the mass of copper *in situ* by forming a cavity in the mass itself and utilizing it as the containing vessel and anode of an electrolytic cell, a copper rod suspended in said cavity forming the cathode, and a matrix inclosing the mass of copper serving as an outer inclosing vessel.

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

THOMAS CRANEY.

Witnesses:

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V. D. KINNER.