C. M. T. du MOTAY & E. STERN.

Process and Apparatus for Melting Ores in their Natural Situation.

No. 213,789. **Patented April 1, 1879.**

Fig. 1.

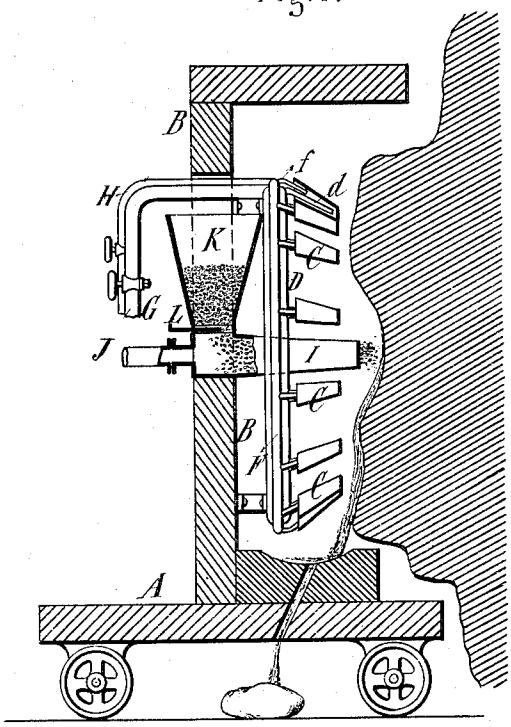
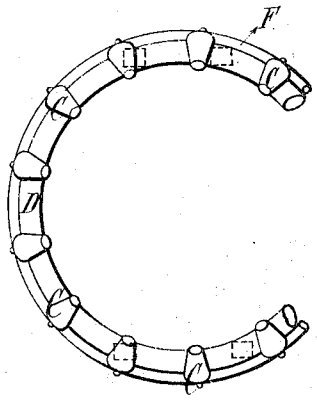


Fig. 2.



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UNITED STATES PATENT OFFICE.

CYPRIEN MARIE TESSIÉ DU MOTAY, OF PARIS, FRANCE, AND EDWARD STERN, OF NEW YORK, N. Y.

IMPROVEMENT IN PROCESS AND APPARATUS FOR MELTING ORES IN THEIR NATURAL SITUATION.

Specification forming part of Letters Patent No. **213,789**, dated April 1, 1879; application filed November 22, 1878.

To all whom it may concern:

Be it known that we, Messrs. CYPRIEN MARIE TESSIÉ DU MOTAY, chemist, of Paris, France, and EDWARD STERN, of the city and State of New York, United States of America, have invented an Improved Process and Special Apparatus for Melting, and thus Extracting, Native Copper, Metallic Ores, and Rocks, of which the following is a specification:

Our invention consists, first, of an improved process for melting ores on the spot; and, second, in an improved apparatus for carrying out this process.

The process consists in directing against ores in their natural situation an intensely-hot flame, preferably that produced by what is known as the "compound blow-pipe;" and my apparatus consists in the arrangement of blow-pipes for carrying out the process above described—namely, a series or crown of blow-pipes surrounding a central pipe, all of said pipes being arranged upon a carriage, so as to be readily brought into contact or juxtaposition with the ores in their natural situation.

This process is particularly useful in the rendering of those masses of native copper which are too tough to be cut up by knives or blasted with powder with any economy, and which have heretofore been valueless.

By our process these and other similar ores can be melted on the spot, thereby avoiding the necessity of cutting or breaking them up.

The apparatus or compound blow-pipe which we have invented has for its object to extract metals from fusible metalliferous rock by means of fusion, such as native copper, sulphurets of copper and of iron, higher sulphurets of iron, copper, and lead, sulphurets of lead, simple or complex, antimonial ores, &c.

This blow-pipe is composed of one or several crowns or series of piping supplied with a mixture of gas and air blown in the direction of the center of fusion. It is traversed by one or several central air, gas, and coal-dust pipes, thus concentrating the whole of the caloric-power of the fire upon the zone required to be melted, and preventing the caloric from being dispersed, owing to its being stored in the rock to be melted. Moreover, in consequence of the injection of coal-dust likewise in the direction of the center of fusion, no oxidation can take place, either of the metals or of the sulphureted compounds to be extracted by means of fire. The coal-dust may be substituted by tar, petroleum, or other hydrocarbons.

Figure 1 is a profile elevation, and Fig. 2 a front view, of a portion of the blow-pipe.

In order to explain the working of our invention, we have shown in the annexed drawings an apparatus constructed and put up according to our system.

The apparatus is mounted upon a truck, A, which allows its removal to the place of extraction and its moving forward progressively as the rock is attacked. Upon this truck is placed the transverse wall B, which bears the piping of the compound blow-pipe. This wall or partition has also the object of acting as a screen to prevent the heat engendered during the fusion from inconveniencing the men who attend to the work.

The outer pipes, C C, are arranged in the form of a crown and attached to the circle of gas and air pipes shown, which pipes are suitably connected with the gas and air supply, and are fastened to the wall B by means of stays. They consist each of a tube, C, inclosing two concentric tubes, *d* and *f*, forming a blow-pipe. These pipes are inclined, so as to converge their flames toward the center of fusion. They are supplied with air and gas by two annular conduits, D and F, communicating with two tubes, G and H. The conduit D receives air from a ventilator or blast, while F is supplied with combustible gas from any reservoir or gasometer.

Instead of a single crown, as shown in the drawings, the apparatus may possess several concentric crowns of piping.

The ventilator and the gas-reservoir are borne by the special truck with the stationary or other engine which serves to actuate the ventilator.

Midway in this crown of blow-pipes is placed the central pipe, I, consisting of a wide conical tube, the narrow end of which faces the rock to be melted. Its wide end is supplied with air and with the combustible used. The air is injected by the tube J. The combusti-

ble, which we will suppose to be coal-dust, is inclosed in a funnel, K, arranged above the tube, and the bottom of which consists of a slide-valve, L, which is worked from the outside.

The blow-pipe thus constructed works in the manner stated above. The outer piping direct their flames toward the place in the rock requiring to be melted, where the flames meet with the air and the coal-dust injected by the central tube. In this mode sufficient heat is obtained for melting the metallic ore, while at the same time the coal furnishes an element which prevents the molten metal from oxidizing.

The arrangements of the apparatus may be varied in detail; especially may the double crown of blow-pipes be arranged so as to place it in a vertical or horizontal position, according to the portions of rock to be melted.

We are aware that rocks have before now been heated for the purpose of subsequent pulverization by water, and that apparatus has been used for this purpose, and also that drill-holes have been increased in size by melting the rock at the bottom and removing it; but we do not claim either of these inventions.

We claim as our invention—

1. The process of mining and reducing copper in its natural situation, which consists in directing against said copper in its natural situation a reducing-flame, thereby melting and reducing said copper, and rendering it capable of removal, substantially as described.

2. The process of mining and reducing ore in its natural situation, which consists in melting and reducing such ore by a sufficiently hot flame and of simultaneously bringing into contact with such melted ore a sufficient supply of gas rich in carbon, or of coal-dust, for the purpose of preventing the oxidation of the metal when in a state of fusion, as set forth.

3. The combination of a ring of compound blow-pipes surrounding a central blow-pipe, and a movable carriage or truck supporting said blow-pipes for the purpose of enabling the movement and operation of the flame from said blow-pipes against the copper or other ores in their natural situations, and apparatus for receiving the ore when melted, substantially as described.

4. In an apparatus for melting copper or other ore in its natural situation, a crown or circular series of blow-pipes surrounding a central pipe, thereby producing a circular or annulus of flame surrounding a central flame, for the purpose of melting the rock by means of the central flame, and at the same time preventing too great radiation or escape of the heat of said flame, substantially as described.

In testimony whereof we have signed our names to this specification before two subscribing witnesses.

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Witnesses:
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