

UNITED STATES PATENT OFFICE.

CHARLES WESSELL, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO
CHARLES A. WESSELL, OF SAME PLACE.

PROCESS OF MELTING THE ORES OF COPPER OR OTHER METALS.

SPECIFICATION forming part of Letters Patent No. 428,659, dated May 27, 1890.

Application filed July 5, 1889. Serial No. 316,577. (Specimens.)

To all whom it may concern:

Be it known that I, CHARLES WESSELL, a citizen of the United States, residing in New York city, New York, have invented a new and useful Process of Melting the Ores of Copper or other Metals, of which the following is a full, clear, and exact description.

My process is applicable to the treatment of ores in general; but it is especially adapted to highly-refractory ores of copper or other metals which hitherto it has been very difficult, if not impossible, to treat by any process at such a cost as to make the process commercially practicable. These highly-refractory ores usually contain a number of different metals in various quantities.

The object of my invention is to separate the silica and gangue or earthy materials and similar substances from the metals, sulphides, and similar substances of the ore and to concentrate all or nearly all of the metal it contains. The metals are generally obtained in the form of a matte, from which the different metals can be reduced and separated in any well-known way.

My invention consists, partly, in the use in such a process of a combination of certain chemical substances or agents.

It also consists in the method of treatment to which the ore and the agents are subjected, and in the proportions in which the said agents are employed, all as hereinafter more particularly described and claimed.

My process consists, briefly, in adding to or mixing with the ore carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid in such a manner as to enable these substances to become sufficiently intermingled and associated with the ore, and to insure their efficient action upon the entire body of ore, and then raising the mass to a melting heat or sufficiently to produce a concentrated matte or to separate the silica and gangue or earthy materials from the metals, sulphides, and similar substances. The matte or metallic substance produced is then allowed to cool, or is drawn off or tapped and allowed to cool.

My process is carried out as follows: The ore is first broken up or crushed by any suitable means until it is of about the size of

gravel. It may be found advantageous in some cases to crush it to the size of fine sand or to impalpable powder. A solution in two quarts of water is then made of the following substances in the following quantities or proportions: Four ounces of carbonate of potash, four ounces of chloride of sodium, four ounces of nitrate of soda, and four ounces of boracic acid. In making this solution I prefer to use water at a temperature of about 200° Fahrenheit. The different substances named can be added to the water one after the other, or they can be mixed together in a dry state first and then dissolved in the water. This solution is then applied to the crushed ore by sprinkling or pouring it upon the ore, so as to bring the chemical agents into as intimate and complete contact as possible with the particles of the ore. When the solution is being thus applied to the ore, the ore should be stirred by any suitable means, so as to aid in making a thorough mixture of the ore and the solution.

The quantity of the solution above stated I have found to be sufficient for the treatment of about fifteen pounds of crushed chalcopryite-copper ore. The relative quantity of the solution, however, will have to be varied somewhat in accordance with the character of the ore to be treated. After the solution has been applied to the ore the ore is raised to a temperature of about 150° Fahrenheit, and held at that temperature for from twenty-four to thirty-six hours, depending partly upon the size to which the ore is reduced in the crushing operation and partly upon the quality of the ore itself. The more thoroughly the ore is crushed or subdivided the shorter will be the time required in which the ore, after the application of the solution, is held at the above temperature. The ore is then placed in a crucible or other suitable receptacle, and is raised to a temperature sufficient to melt the mass and produce a concentrated matte at the bottom thereof. The matte is then allowed to cool, or tapped, or drawn off into any suitable vessel and allowed to cool. In this way a matte will be obtained containing the various metals to be found in the ore, which can be reduced and separated from one another by any well-known method.

Various modifications can be made in the different steps of the process which have just been described. Thus the chemical agents employed in the process can be applied to the crushed ore in a dry state, instead of in a solution, and mixed with the ore in that form; but this mode of carrying on my process is not so advantageous as the former. Again, the relative proportions of the different chemical substances may be varied. I have found that where the ores are rich in silver it is best to double the relative quantity of chloride of sodium, using one part of each of the other three substances to two parts of chloride of sodium. Again, the solution may be made stronger or weaker by increasing or diminishing the amount of chemicals for a given quantity of water. The temperature of the ore during the time it is held prior to reduction may also be varied to some extent.

The best form of my process, however, is the one which is described above.

What I claim as new, and desire to secure by Letters Patent, is—

1. The process of treating ores, which consists in adding to the ore carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, and then heating the mass to a melting heat.

2. The process of treating ores, which consists in breaking up the ore, then adding thereto carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, and heating the same to a melting heat.

3. The process of treating ores, which consists in breaking up the ore, adding thereto carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, allowing the mixture to stand for about twenty-four hours or more, and then heating the mass to a melting heat, substantially as described.

4. The process of treating ores, which consists in breaking up the ore, adding thereto equal parts of carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, and heating the mass to a melting heat, substantially as described.

5. The process of treating ores, which consists in breaking up the ore, adding thereto equal parts of carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, allowing the mixture to stand for about twenty-four hours or more, and then heating the mass to a melting heat, substantially as described.

6. The process of treating ores, which consists in breaking up the ore, adding thereto carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, heating the mixture to a temperature of about 150° Fahrenheit, keeping the mixture at that temperature for about twenty-four hours or more, and then heating the mass to a melting heat, substantially as described.

7. The process of treating ores, which consists in breaking up the ore, adding thereto equal parts of carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, heating the mixture to a temperature of about 150° Fahrenheit, keeping the mixture at that temperature for about twenty-four hours or more, and then heating the mass to a melting heat, substantially as described.

8. The process of treating ores, which consists in breaking up the ore, adding thereto a solution of carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, and then heating the mass to a melting heat, substantially as described.

9. The process of treating ores, which consists in breaking up the ore, adding thereto a solution of carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, allowing the mixture to stand for about twenty-four hours or more, and then heating the mass to a melting heat, substantially as described.

10. The process of treating ores, which consists in breaking up the ore, adding thereto a solution of carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, heating the mixture to a temperature of about 150° Fahrenheit, keeping the mixture at that temperature for about twenty-four hours or more, and then heating the mass to a melting heat, substantially as described.

11. The process of treating ores, which consists in breaking up the ores, adding thereto a solution of equal parts of carbonate of potash, chloride of sodium, nitrate of soda, and boracic acid, heating the mixture to a temperature of about 150° Fahrenheit, keeping the mixture at that temperature for about twenty-four hours or more, and then heating the mass to a melting heat, substantially as described.

CHARLES WESSELL.

Witnesses:

ROBERT N. KENYON,
EDWIN SEGER.