

UNITED STATES PATENT OFFICE.

EDWARD HUBBARD RUSSELL, OF PARK CITY, UTAH TERRITORY.

TREATING ORES AND METALLURGICAL PRODUCTS.

SPECIFICATION forming part of Letters Patent No. 381,849, dated April 24, 1888.

Application filed June 24, 1886. Serial No. 206,150. (No specimens.)

To all whom it may concern:

Be it known that I, EDWARD HUBBARD RUSSELL, of Park City, in the county of Summit, and in the Territory of Utah, have invented certain new and useful Improvements in Treating Ores and Metallurgical Products; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to an improvement in the treatment of ores and metallurgical products for the extraction of gold, silver, and other precious metals therefrom.

The kind of treatment of ores to which my invention especially applies is lixiviation. In my United States Patents Nos. 295,815 and 295,816 I have described and claimed processes of lixiviation, in carrying out which the ore or metallurgical product is subjected to the action of cupreous hyposulphite in the hyposulphite solution. In such patents the great advantages of the use of a copper salt or compound in connection with the ordinary leaching solution containing hyposulphite of sodium or calcium are fully set forth, so that they need not be stated or described at length here. In carrying out such processes the copper salt or compound, preferably the sulphate of copper or blue-stone, is added to the hyposulphite solution before allowing the solution to reach or pass through the ore or product. In such case the ore or product is not exposed to the action of any copper salt or compound until it is exposed to the action of the cupreous hyposulphite in the solution. It is then acted upon at the same time by the compound or salt that has been formed by reaction taking place in the hyposulphite solution upon the addition of the copper salt, and also by any of such latter copper salt as may remain free or uncombined in the solution.

The object of the present invention is to expose the ore or product to the action of compounds of copper other than the hyposulphite thereof before the use of a hyposulphite solution upon such ore or product, for the purpose not only of forming cupreous hyposulphite in the ore and solution when the hyposulphite solution is subsequently used, but also of counteracting the injurious effects of hydrates of various elements which may exist in the ore and which are decomposed or neutralized by the copper compounds.

With these ends in view my invention consists in the process and improvement in the art, as hereinafter specified.

In carrying out my process the ore or product is placed in a suitable ore-tub and then the solution (aqueous or otherwise) of copper salt or compound is mixed with the ore or product by any of the well-known methods. The salt of copper which I prefer and generally use for this solution, which I term the "preliminary" solution, is the sulphate of copper or blue-stone; but I contemplate using instead other compounds or salts of copper—as, for instance, the chloride nitrate, carbonate, or acetate cupreous carbonate, ammoniated copper, or hydrate of copper. After the mass of ore or product has become saturated with this solution the latter can be either immediately drawn off or left standing in the ore until the desired reactions are completed. Usually it does not interfere with or make any practical difference in the action of the hyposulphite leaching solution used in the subsequent step in the process if the preliminary copper solution is still in the ore or product, instead of being allowed to drain out. Instead of using an amount of this preliminary copper solution sufficient to saturate the ore, a much less amount of the solution may be used, even as little as one-tenth of that necessary to saturate the charge being sometimes sufficient. Usually for a charge of ore or metallurgical product from one to six inches of water, in which is dissolved from one to five pounds of blue-stone per each ton in the charge, is enough. As this solution sinks down through the charge, the sulphate of copper attacks and decomposes the hydrates of various elements which may exist in the ore, and which, as is well known, very materially interfere with and prevent the desired dissolving action of a hyposulphite leaching solution used to leach the ore. The sulphate neutralizes the injurious effects of caustic soda or lime or the hydrates of other metals existing in the ore by the formation of hydrate of copper. After the solution of sulphate of copper has been in the ore a sufficient time to complete this, (its neutralizing action,) the ordinary hyposulphite leaching solution containing usually the hyposulphite of sodium or calcium, is used upon the ore in any of the well-known ways of using a leaching

solution. As it passes through the charge, not only is its dissolving action not interfered with by the presence of any caustic lime, soda, or other hydrates in the ore, but any caustic soda, lime, or other hydrates which may exist in the solution itself are neutralized by the copper compounds formed in or left in the ore by the sulphate-of-copper solution previously used. Moreover, as the ordinary hyposulphite solution passes through the ore the cupreous hyposulphite solution such as is described as used by me in the processes covered in my patents referred to hereinbefore is formed by the union of the copper salts or compounds formed in the ore or left therein by the preliminary sulphate solution with the hyposulphite in said hyposulphite solution. By the present process, then, the ore or metallurgical product is really subjected to the action of a hyposulphite solution to which one or more copper compounds have been added as the solution passes through and acts upon the ore.

The ordinary simple hyposulphite solution when used upon the ore in the second step of my present process, after the use of the preliminary copper solution on the ore, becomes then, by the action of the salts or compounds of copper which it meets and takes up on its passage through the ore, the "extra" or compound solution, the use of which upon ore or metallurgical products is fully described and covered by the claims in my patents referred to. It is this compound or extra solution which acts upon the ore or product when the second step of the present process is being carried out. The present process, then, involves a new method of preparing such extra or compound leaching solution for action upon the ore—that is, a new way of introducing a copper salt or compound into the hyposulphite solution.

Instead of preparing and using the small

amount of the preliminary copper solution described above, enough may be made up to saturate one or more charges and used upon several charges until its strength is exhausted. I contemplate also using in the second step of the process, after the copper solution has been used on the ore, my extra or compound leaching solution described hereinbefore, containing cupreous hyposulphite instead of the ordinary hyposulphite leaching solution; but I prefer the latter for general use.

Having thus described my invention, what I claim is—

1. As an improvement in the art of extracting metals from ores or metallurgical products, the method of preparing the ore or product for the use thereon of a leaching solution, which consists in treating the ore with a solution of a compound or salt of copper, substantially as and for the purpose specified.

2. The process of extracting metals from ores and metallurgical products, which consists in subjecting the ore or product to the action of a solution of a copper salt or compound and then treating the ore or product with a hyposulphite solution, substantially as and for the purpose described.

3. The process of extracting metals from ores and metallurgical products, which consists in first treating the ore or product with a solution of sulphate of copper and then subjecting the ore or product to the dissolving action of a hyposulphite leaching solution, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 15th day of June, 1886.

EDWARD HUBBARD RUSSELL.

Witnesses:

WILL. E. RACE,
CHARLES HERMAN.