

UNITED STATES PATENT OFFICE.

W. F. STEWART, OF AUSTIN, NEVADA TERRITORY.

IMPROVED PROCESS FOR AMALGAMATING ORES.

Specification forming part of Letters Patent No. 45,534, dated December 20, 1864.

To all whom it may concern:

Be it known that I, W. F. STEWART, of the city of Austin, in the county of Lander and Territory of Nevada, have invented a new and Improved Mode of Working Silver Ores and for Saving the Amalgam and Quicksilver in Quartz-Mills; and I do hereby declare that the following is a full and exact description of the said invention.

In working silver ores the waste and loss of amalgam and quicksilver is occasioned by an excess of sulphur and mineral oxides which exist in the powdered ore or pulp. The mercury is carried off in the washing in the condition of a protosulphuret of mercury, and the amalgam is carried off by becoming attached to the oxidized particles of lead, iron, antimony, bismuth, &c. To prevent this waste and loss, and to work the ores more economically and expeditiously, is the purpose and claim of my discovery.

Process for working silver ores.—First, crush the ore in the usual way with stampers in a battery; second, place the powder or pulp in tubs or pans and saturate with hot water or steam; third, to the pulp add ten per cent. of common salt, or sufficient quantity to reduce the silver to a chloride, then stir for half an hour; fourth, add sufficient metallic iron (filings, if possible) to reduce the chloride to muriate of iron; fifth, add sufficient quicksilver to amalgamate all the silver in the pulp; (as ores differ greatly in richness, experience will have to determine the quantity to be used;) stir half an hour; sixth, to one hundred pounds of gray sulphuret ore use two or three ounces of carbonate of potash; (the quantity must be increased or decreased according to the oxidized particles which appear in the pulp;) also, add one pennyweight of pulverized metallic copper and ten grains of protoxide tin; stir for two hours in warm water; seventh, dilute one ounce commercial nitric acid in two gallons water; pour into the pulp and stir for ten minutes; then add two gallons strong lime-water (carbonate of lime) and stir for fifteen minutes; eighth, wash the pulp in clear water; draw off the quicksilver and separate the amalgam by straining through buckskin or canvas.

It will be seen that the above proportions are given as an approximate idea of what is

requisite for one hundred pounds of pulp; but as there are scarcely two mines in this country the ores of which are identical, much will depend upon the experience and judgment of the amalgamator in relation to the quantities to be used.

In addition to my mode of working the ores from the battery, I save the amalgam and quicksilver which may have escaped in the tailings of quartz-mills, as follows: The tailings or sand is placed in a vat or tub containing a bath of water, carbonate of potash, protoxide of tin, and copper filings. The mass must be stirred occasionally, and should remain in the bath four or five hours. (The proportions of each ingredient must be determined by the condition of the pulp.) The tailings are then taken from the bath and passed through an oscillating wire sieve (ordinary meal-sieve.) This will divide the quicksilver into myriads of fine particles and cause it to gather into a mass instantly, for the reason that the sieve literally skins each globule from its tenacious coating of protosulphuret. After sifting, the pulp is submitted for a few minutes to a bath of weak dilute nitric acid. This will form nitrate of lead of any litharge which may remain in the mass; and nitrate of lead is soluble in water. The acid will partially cleanse the mercury and prepare it for manipulation. The pulp must then be washed in clean water and the precipitated quicksilver drawn off. The remaining mass will be a dingy-black amalgam, having the appearance and consistency of black lead and grease. It is then rubbed and washed in a common porcelain mortar, first with a hard pestle and then with a gum-elastic pestle, until all the sulphur is driven off and the whole reduced to clean quicksilver.

The philosophy of the above process may be briefly stated as follows: Most of our silver ores are either sulphurets of silver and iron, silver and antimony, silver and lead, silver and arsenic, or some other compound of sulphur. When the pulverized sulphurets come in contact with mercury, vast quantities of the latter are converted into a protosulphuret of mercury and carried off in washing. It is well known that native or metallic copper has a strong affinity for quicksilver, and hence its use in precipitating the mercury and liberating the sulphur when applied to the proto-

sulphuret. The remarkable affinity between carbonate of potash and oxygen renders it an active agent in deoxidizing particles which exist in the pulp, and hence its use in above process. Protoxide of tin, a remarkable substance, whose aristocratic nature prevents it from associating with any but the royal metals, makes it the best known precipitant of silver, gold, platina, and other fine minerals.

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

A new and improved mode of working silver ores and saving amalgam and quicksilver, as above described.

In testimony whereof I have hereunto set my hand and seal, in the city of Virginia, Territory of Nevada, this 10th day of June, A. D. 1864.

W. F. STEWART. [L. s.]

In presence of—

H. H. WINCHELL,
I. W. SHIELDS.