

UNITED STATES PATENT OFFICE.

FRANK DIBBEN, OF NEW YORK, N. Y.

IMPROVEMENT IN METHODS OF AMALGAMATING ORES OF THE PRECIOUS METALS.

Specification forming part of Letters Patent No. **32,686**, dated July 2, 1861.

To all whom it may concern:

Be it known that I, FRANK DIBBEN, of the city and county of New York, in the State of New York, have invented a certain new and useful process of amalgamating metals which are contained in finely-divided earthy matter; and I do hereby declare that the following is a full and exact description thereof.

My invention is a novel means of presenting mercury to the gold or other metal lying in finely-divided or crushed rock.

In my invention mercury is deposited or "thrown down" upon the gold or other metal particles from a soluble salt of mercury by what is sometimes denominated as "local electro-chemical action," which local action is obtained by means of finely-divided metallic particles intimately mixed with the mass of pulverized mineral, the said metallic particles being positive relatively to the metal in the gangue, and serving as the anode to the said local circuits.

It is well known that mercury may exist in the form of a soluble salt. The bisulphate prepared with a slight excess of acid is such a salt, and is one of the most desirable for my purpose; but any soluble salt of mercury may be used in its place, if preferred. It is also well known that a solution of such salt will, if properly presented thereto, permeate uniformly every interstice in a mass of pulverized quartz or metal-bearing rock.

I prefer to employ a tight vessel nearly filled with the broken or crushed mineral saturated with a solution of the bisulphate of mercury, so that a slight stratum is visible as a clear liquid upon the surface; but any other means of filling or partially filling the interstices with the salt of mercury may be employed, if preferred.

Before applying the solution I intimately mingle with the pulverized mineral finely-divided zinc or any other substance which will form an electro-positive pole or anode in relation to the metal in the mineral. That particle of zinc which is near or in contact with a particle of gold forms the anode or positive pole for a simple circuit, the gold being the negative pole or cathode and the solution of bisulphate of mercury the exciting-fluid and conductor. Innumerable circuits of this character will be formed throughout the mass. The electro-chemical action in such case is as follows: The slight excess of acid attacks the

zinc, forming sulphate of zinc and inducing an electro-chemical current or action from the zinc to the particle or particles of gold which may be in electric contact. Under such action the bisulphate of mercury in the solution commences, according to laws well known, to be decomposed and the mercury to be deposited or thrown down in its pure metallic form directly upon the gold or cathode, while the sulphuric acid is set free, and in its turn unites with and dissolves additional zinc, sustaining the electro-chemical action and forming sulphate of zinc. The latter salt, if the quantity of gold and zinc is sufficient, so that the action proceeds for a sufficient time, will ultimately displace the bisulphate of mercury. It is therefore important to make the solution of bisulphate of mercury originally of sufficient strength to supply mercury in adequate quantities to amalgamate with every particle of the gold.

In practice I employ a liberal quantity of the salt of mercury and allow a considerable time—say twenty-four hours—for the action to proceed. It is desirable to agitate the mass mechanically in a tumbling-cylinder or in some other convenient manner, either constantly during the process or at intervals—as, for example, after the action has proceeded several hours—and then allowing another period of rest. The application of heat during the process is of advantage; but neither the heat nor the mechanical agitation is absolutely necessary.

The quantities of the several materials which I find to work well in practice are as follows: Having found by analysis the amount of gold to the ton or other quantity of the gangue, I then add for each pound thereof one pound of zinc and four pounds of the bisulphate of mercury and the proper quantity of water to permeate the mass.

By my method of presenting the anode in the form of fine particles uniformly distributed throughout the mass, in lieu of depending on the metal of the containing-vessel or of the scrapers, &c., employed in the manipulation for such positive pole or anode, I present for inducing local electro-chemical action a very great surface at a very slight cost, and present it at the points where it is most required—*i. e.*, in the immediate vicinity of the several particles of gold or other precious metal throughout the entire mass.

The gold or other metal may, if preferred,

be entirely amalgamated by the above process, and may afterward be separated from the mass by mechanical agitation, either with or without the employment of heat, in any ordinary manner; but the plan I prefer to use, and for which the above proportions are proper, is to commence the action and continue it until the finest particles are amalgamated and the larger ones coated with mercury, after which the process may be completed by any mechanical method of amalgamation. In such case I esteem it important that the proportion of the distributed zinc be so great that the acid held by the salt in the commencement of the process shall at the later stage be so saturated with zinc that it is harmless in its effects upon the machinery employed in the mechanical manipulation.

I do not limit myself to the use of particles of zinc to be thus distributed as the anode, but may employ particles of other metal—as iron filings—in the place thereof whenever suitable

particles of any positive metal can be readily obtained at a sufficiently cheap rate.

Having now fully described my process of amalgamating metals, what I claim as new therein, and desire to secure by Letters Patent, is—

The process of amalgamating a precious metal contained in a finely-divided matrix by depositing or throwing down mercury thereon from a soluble salt of mercury by local electrochemical action induced between the precious metal and particles of zinc or other suitable material distributed throughout the mass to serve as a positive pole or anode, substantially as and for the purpose herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANK DIBBEN.

Witnesses:

G. H. BABCOCK,

A. SNYDER.