

When the gold is fine and free I treat the ore or other compound in a crushed or powdered condition to the action of the cyanuric-acid-contained cyanide solution in suitable containing vessels such as are usually employed in wet processes of extracting the precious metals, and separate the solution from the residue and the gold or silver from the solution by any usual or suitable methods or means; but when the gold is coarse, or is partly coarse and partly fine, and water is scarce, I fit the solution-containing vessels with suitable stirring apparatus, and treat the powdered ore or compound to the action of the cyanuric-acid-contained cyanide solution in the presence of mercury or of an amalgam of mercury and sodium or potassium, whereby I obtain a ready amalgamation of the coarser particles of gold and solution of the finer particles thereof, which latter are then displaced by the sodium or potassium, and amalgamate with the mercury.

When the ores carry much silver as sulphides it is best to have the solution more alkaline than when the ores carry only gold or silver in the metallic state.

Tailings, concentrates, and refractory ores generally are especially susceptible to treatment by the cyanuric-acid-contained cyanide solution.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The extraction of precious metals from their ores, or from compounds containing the same, by the use of a solution of cyanide of potassium or other cyanide or cyanogen compound of the nature aforesaid containing cyanuric acid or a cyanurate.

2. The extraction of precious metals from their ores, or from compounds containing the same, by the use of a solution of cyanide of potassium or other cyanide or cyanogen compound of the nature aforesaid containing cyanuric acid or a cyanurate, and in the presence of mercury, or of an amalgam of mercury and sodium or potassium.

Dated this 10th day of July, 1896.

JAMES MACTEAR.

PROCESS OF AND APPARATUS FOR EXTRACTING GOLD FROM ITS ORES.

I, John Glenville Murphy, mining engineer, of Middletown, County of Middlesex, State of Connecticut, United States of America, do hereby declare the nature of my invention for "Process of and Apparatus for extracting Gold from its Ores," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention is an improved process of and apparatus for extracting gold from its ores. Gold is found in ores of two kinds, which are known as "free-milling" ores and "refractory" ores. What are called the "refractory" of gold are such as contain gold sparsely disseminated throughout their bulk, mechanically surrounded or enveloped by baser material, or so united with other elements as to form chemical combinations therewith. Such ores, among others, are those which contain galena, zinc-blende, iron-pyrites, white iron (arsenical), and the ores of copper.

The free-milling ores have a large percentage of their gold in a finely-divided flake, molecular, or flour state, and much of this flour gold is wasted or lost in the process of milling, either being carried away by the force of the water necessarily used in connection with the stamp-mill, or remaining unreleased from the rock or gangue and being rejected along therewith.

The stamp-mill, which can be used only with free-milling ores, is necessarily wasteful of a large percentage of flour gold, and the smelting processes heretofore used in reducing refractory ores are expensive. In other words, ores do not in practice yield the quantities of gold which careful chemical analyses show them to contain, or, if they do, the cost of getting the gold exceeds its value. I have invented a method or process of recovering the gold from all such ores, and an apparatus or arrangement of machinery whereby this process may be made effectual, and my method and apparatus are applicable as well to refractory as to free-milling ores. I have found by actual experiments, and by practical exploitation of my invention, that, so far as the results go, it is immaterial whether the gold in ores such as I have mentioned is united to other elements, chemically, mechanically, or otherwise—the point of my discovery being that the gold may be recovered completely from such ores, and the same thereby rendered of value nearly equal to the absolute amounts of gold they contain, at a comparatively small expense.

While it may not be absolutely true that gold is chemically united with baser elements in all of the refractory ores, it would seem to be true that in some of them at least there is a quasi-chemical union existing between the gold and some one or more of the other elements or combinations of elements. Whatever the real nature of the union may be, the fact is known to all practical mining engineers and chemists that from some ores fairly rich in gold it is impossible to get reasonable returns except at great expense for transportation and smelting, whereby their commercial values are destroyed. I have discovered that all these ores may be profitably milled by reducing the entire body of gold-bearing ore uniformly and completely to an impalpable powder by gentle attrition, and treating this powder for the separation of gold by amalgamation.

That extreme comminution or progressive subdivision of a compound substance mechanically will produce chemical change may or may not be true, but it is certain that such extreme comminution renders chemical change more readily possible than it would otherwise be, other things being equal. It is also certain that if the union between elements in any substance is merely a mechanical mixture, a conglomeration, or solution, minute subdivision of such substance may be carried far enough to separate the elements themselves.

In all methods, processes, and machines heretofore devised for extracting gold from its free-milling ores there has been one defect which is wasteful of a large percentage of flake, flour, or molecular gold. This defect is written in plain characters upon the face of every apparatus and every process in use at the present day, and the practical novelty and utility of my invention appear as soon as the case is stated.