

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

The herein-described process of adding a further solution of cyanogen or cyanide as and for the purposes substantially as described herein.

Dated this 17th day of December, 1894.

HENRY HUGHES, F.Inst. Patent Agents,
Agent for the Applicant.

IMPROVEMENTS IN EXTRACTING METALS WITH NEW SOLVENT MATERIALS.

I, John James Hood, of 1, Fenchurch Avenue, in the City of London, England, chemist, do hereby declare the nature of my invention for "Improvements in Extracting Metals with New Solvent Materials," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The improvements described herein relate to metallurgical processes for the extraction of valuable metals from their ores, and have for their object, not primarily the precipitation of a more valuable metal from its solution at the expense of a less valuable metal, but the solution or dissolving of a more valuable metal by the precipitation of a less valuable one. Such improvements have regard more particularly to the precious metals—gold and silver—which, as is well known, occur frequently in their ores in a metallic state.

I employ for the extraction of such metals a solution of a salt or compound of a baser metal which, on being brought into the presence of the precious metal (whether in a metallic state or otherwise), causes it to pass into solution by reason of its displacing the baser metal in the solution. The extraction of the precious metals is effected by washing the ground ores with such a solution.

Taking gold as an example, I will now describe several such solutions of metallic salts as will dissolve gold, while the baser metal is precipitated, and will set forth how the solutions are prepared and worked, and the method of recovering the gold from the solutions.

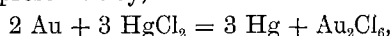
If metallic gold or natural auriferous ores be treated with certain solutions of salts of mercury or lead or other base metals, the gold is dissolved with great ease, the base metal being precipitated.

The metal I prefer to employ is mercury, but lead does as well, and several other metals will do, though less conveniently. This preference is because the base metals, like lead, tend to form a hard covering upon the particles of gold, and so to render the further solutions of precious metals slow, whereas in the case of mercury, as it is precipitated on the particles of gold it remains fluid, and hardly, if at all, retards the solvent action of the solution employed.

To prepare such an active solution in one way I take the cyanide, sulphate, chloride, or oxide of mercury, or other compound of mercury soluble in an alkaline cyanide, and dissolve it in a solution of a suitable alkaline cyanide, preferably soda or potash cyanide, or mixtures of these. Alkali, either as caustic or carbonate (by preference caustic soda), is in practice also added. If the material is being prepared for export, any insoluble matters are allowed to settle out and the clear solution is evaporated to dryness. This can readily be done, for the presence of the metallic salt prevents loss of cyanide during the evaporation. A mixture that answers well consists of two parts by weight of cyanide of potassium, or its equivalent of cyanide of sodium, one part of mercuric chloride, or its equivalent of sulphate or other mercury salt, and from one half to two parts of caustic soda.

If a small quantity of this solution be placed upon gold, mercury is quickly deposited and gold goes into solution.

Estimating the amount of gold dissolved for a given amount of mercuric chloride, the reaction appears to be in its first stage represented by,—



or, roughly, two parts by weight of mercuric chloride employed on a quantity of auriferous quartz with an alkaline-cyanide solution will dissolve one part of gold.

If pure gold be treated with the above solution and kept warm, a secondary reaction probably takes place, resulting in the amount of gold dissolved being greater, as compared with the mercuric chloride, than the above proportion. This may possibly be explained by the solvent action of the auric salt acting on the metallic gold to form an aurous salt in the presence of alkaline cyanide, just as a ferric salt will dissolve metallic iron to form a ferrous salt.

To prepare another base metal for dissolving gold, for instance, lead—I take one of its compounds, such as ordinary litharge, boil it with caustic alkali to dissolve as much as possible, and mix this alkaline lead-solution with the alkaline cyanide, and employ the mixed solution as in the case of mercury.

Such a solution poured upon metallic gold soon gives a black deposit of metallic lead, and gold goes into solution.

These gold-solvents may be converted into solid masses and packed for export, or they may be prepared as required at the mines from the constituents.

Although I have mentioned certain salts of baser metals in the preparation of my solution I do not restrict myself to these salts. I mention them because they are merely convenient and cheap salts to use in the preparation of my solution which, when prepared, consists essentially of the cyanide of an alkali with some salt of a baser metal in solution; and in all these cases the precious metal, when being dissolved, is acted upon by a solution which contains a baser metal, or some salt of a baser metal, in solution in the presence of an alkaline cyanide; and all the solutions act upon the precious metals in the same way—that is to say, by the precious metal displacing the baser metal in that solution.

Instead of preparing this metallic compound in the manner above indicated, in which caustic alkali is employed, I may omit the caustic at this stage and proceed by reacting upon a soluble