Improvements in Processes of and Solvents for Separating Precious Metals from their Ores.

I, William A'Court Granville Birkin, residing at Nottingham, England, mining engineer, do hereby declare the nature of my invention for "Improvements in Processes of and Solvents for separating Precious Metals from their 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 relates to the extraction of metals, and particularly to precious metals, from their ores.

It is the purpose of my invention to provide a novel and simple process for the purpose named, whereby the pulverised ores are subjected to the action of a solvent compound to dissolve the metals, which are afterwards separated from the solution in any suitable manner.

My invention also has for its purpose the provision of a novel fluid compound especially adapted for the decomposition of the precious metals from the ores in which such metals are contained.

The invention consists to these ends in the process of treatment and in the novel fluid compound hereinafter fully described, and then more particularly pointed out and defined in the claims annexed to this specification.

To enable others skilled in the art to which my said invention pertains to fully understand and practice the same, I will proceed to describe said invention fully and in detail, and will then indicate briefly the novel parts or features thereof.

In the practical use of my said invention I follow, in substantial respects, a mode of procedure consisting of the following steps: The ore is first pulverised to a suitable fineness, which will be controlled usually by the refractory character of the ore, the more unyielding being preferably reduced to a finely-pulverised condition. The pulverised or finely-divided ore is then placed in a menstruum consisting of potassium cyanide and ferri-cyanide in water, to which a suitable quantity of peroxide of hydrogen is added to intensify the acid reaction. The ore is subjected to agitation, while attacked by this solution, by any convenient means.

When the process is completed the fluid, which then contains the metals in solution or suspension, is drawn off or decanted, or otherwise separated from the mineral constituents of the ore, and the values are eliminated either by precipitation, deposition, electrolysis, or by any other method preferred for this purpose.

I may, and in some cases shall, employ heat to aid and expedite the action of the fluid compound described in attacking the metals of the ores, but I do not limit my invention either to the use or to the absence of this step.

I prefer to employ the ingredients mentioned in about the proportions following, viz.: To one gallon of water I use about 3oz. of potassium cyanide, and with an equal quantity of water I mingle about 1oz. of potassium ferri-cyanide. To the mixture of the two solutions named I add about 5 per cent. of peroxide of hydrogen, these proportions being regarded as preferable.

This matter is subject to a considerable variation, however, and I do not limit myself to any particular or special proportion.

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,—

1. In the art of separating metals from their ores the process set forth, which consists in subjecting an ore suitably comminuted to the action of a menstruum composed of potassium cyanide, potassium ferri-cyanide, and peroxide of hydrogen in water, agitating the said ore, and finally separating the values out of solution, substantially as described.

2. The fluid solvent for removing precious metals from their ores, the same consisting of potassium cyanide, potassium ferri-cyanide, and peroxide of hydrogen in water, in the proportions specified or thereabouts, substantially as described.

Dated this 17th day of March, 1894. W. A. G. Birkin.

Improvements in Extracting Gold and Silver from Ores and other Compounds.

I, James Alexander Walker, of Kuaotunu, in the Provincial District of Auckland, in the Colony of New Zealand, assayer, do hereby declare the nature of my invention for "Improvements in extracting Gold and Silver from Ores and other Compounds," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My improvement refers to the extracting of gold and silver from ores and other compounds by the well-known processes such as have been patented in this colony by Messrs. MacArthur and Forrest by letters patent numbered 2,775 and 3,296, and known generally as the "Cassel Process." In this process the ore when powdered is treated with a solution containing cyanogen or a cyanide in a suitable vessel, so as to dissolve the silver and gold, the ore being sometimes previously mixed with or treated with an alkaline earth. When the precious metals are dissolved they are, together with the solution, drawn or filtered off and passed through a mass of metallic zinc, finely divided, in order to recover the precious metals, and are afterwards separated from the zinc by sieving, washing, or both sieving and washing.

Now, in many cases, and more especially where, as is very usual, other and baser metals and substances are mixed with the precious metals in the ore or compound, a considerable percentage of the precious metals is lost, and if more cyanide or cyanogen is used in the first instance, this evil is not diminished, probably on account of its increased action on the baser metals; but I have discovered that if a further solution of cyanogen or cyanide be added after the solution containing the precious metals has been drawn off or filtered, and before it is mixed with the zinc, then a much larger percentage of the precious metals can be saved.

It is evident that the principle of my invention may be applied not only to what is commonly called the "Cassel Process," but to other and similar processes.