

BROMO-CYANOGEN SOLVENTS.

Attention has recently been given to another process which has for its main agent potassium-cyanide, but in conjunction with the latter a small portion of bromo-cynogen is used, which, it is said, accelerates the dissolution of gold to a considerable extent. Dr. Gaze some time ago obtained a patent for the use of this solvent in the Australian Colonies. An article referring to this process appeared in the *Australian Mining Standard*, on the 13th April last, contributed by C. A. Mulholland, Ph.D., Bathurst, New South Wales, in which he states that his process is untrammelled by patent rights, and if it is worth anything this fact alone recommends it to those interested. The two processes differ in so far as in the Sulman-Vautin process cynogen-bromine is employed, whereas in this free bromine is the substance used. Through the courtesy of many friends and mining-managers, and lately through the hearty co-operation of Mr. F. M. Drake, of the Wentworth Proprietary Company, he had been able to test the method on a great variety of ores, tailings, concentrates, and slimes; the results in most cases were good, and in some instances very successful, reaching an extraction of 97 per cent. in a period of time impossible with existing methods. He was indirectly led to experiment on this process by observing the action of bromine on hypo-chlorites.

It is a well-known fact that bromine can displace chlorine from its compounds with oxygen, whilst chlorine can liberate bromine from its compounds with hydrogen. Mr. Mulholland was then induced to try the action of bromine and chlorine on the compounds of cyanogen in the presence of oxygen and hydrogen, in order to ascertain if an analogous action was not possible; but he found that bromine can displace the radical cyanogen from its compounds in the presence of oxygen, and a metal to form a double cyanide of the metal, and a bromate of the halogen, and on this analogous reaction the present process is founded.

He gives us an illustration how the experiment may be tried: a few grains of potassium-cyanide are dissolved in 2oz. or 3oz. of ordinary water, and a leaf of gold introduced into the solution, and poured into a flask. Bromine-vapour is now poured into the flask to displace a portion of the air; the flask is corked and shaken-up, and the gold-leaf is rapidly dissolved. In this experiment it would seem that the following changes occur: The cyanogen is displaced, becoming nascent, and potassium-bromate is formed, the nascent cyanogen rapidly attacks the metal and forms, with two molecules of potassium-cyanide, the double aurous potassium-cyanide.

In conducting these experiments, when an excess of bromine is used potassium-bromide and hydro-cyanic acid are formed. The loss of the acid may be prevented in practice by the addition of a hydrate of the alkalis or earths. The quantity of cyanide used in the process is smaller than is used in the cyanide process alone, and a larger percentage of gold is recovered in a shorter space of time. Mr. Mulholland states that he has recovered 97 per cent. of gold from slimes, and proportionately good results from coarse tailings, ores, and concentrates.

In determining the quantity of chemicals to be used an accurate assay of the ore to be treated is made, and then the percentage of solutions made proportionate to the amount of gold to be dissolved, an actual experiment of the solution being made on the powdered ore. The bromine is applied in various ways, the air is kept agitated, and, from time to time, the bromine is admitted until the proper volume has been passed into the material, or the solution is allowed to percolate through the ore in the presence of the requisite volume of bromine-vapour, or finally air and bromine in suitable proportion are blown through the ore in the leaching-solution.

Messrs. Sulman and Tweed also hold patent rights for the bromo-cyanogen process, but none of these processes have up to the present time been tested on a very large scale to prove their ultimate commercial value in successfully dealing with large quantities of ores.

The recent action taken in England by the Cassel Gold-extracting Company against the Cyanide Gold-recovery Syndicate has resulted in the patent rights of the Cassel Company, with reference to the form of the patentees' application, being declared invalid. This decision will have the effect of causing far more attention to be given to the bromo-cyanogen solvent, and will clear away the obstacle that formerly existed, and that prevented any person making experiments with a view of improving the process.

It may be interesting to those who are using the potassium-cyanide process, and have entered into an arrangement to pay royalty to the Cassel Company, to give an account of the trial in England of the case mentioned, a summary of which is as follows:—

CYANIDE-POTASSIUM PATENT RIGHTS TESTED IN ENGLAND.

An action was brought last year by the Cassel Gold-extracting Company against the Cyanide Gold-recovery Company for using a compound of cyanogen for extracting gold and silver from ores, which was heard in Court III. of the Chancery division of the High Court of Justice before Mr. Justice Romer.

The plaintiffs' plea was that they were the registered owners of certain letters patent, numbered 14,174, granted to John Stewart MacArthur, Robert W. Forrest, and William Forrest, in 1887, for improvements in obtaining gold and silver and other compounds from ores, and they alleged that the defendants had at divers times impugned the plaintiffs' letters patent by employing a process by which gold and silver was dissolved out of powdered ore, by using a solution containing cyanogen, or a cyanide, or a cyanogen-yielding substance, substantially described and claimed in the specifications under which letters patent were granted to the plaintiffs. What the plaintiffs complained of in particular was the erection, use, and exhibition by the defendants of a plant erected at the laboratory of R. H. Harland, F.L.C., F.C.S., Plough Court, 37, Lombard Street, for the treatment of ores by extracting the gold and silver they contained by the use of solution containing cyanogen.

The defendants, on the other hand, denied that any infringement had been made, and alleged that the plaintiffs' letters patent were not valid. The particulars of objection to the validity of letters patent were that the alleged invention was not a subject-matter for a patent, in view of the state of public knowledge at the date, having regard to prior publications. The defendants objected