

undergone amalgamation treatment in berdans pans), the assay from which showed 3oz. 15dwt. of gold, but using the Sulman-Teed solvent, of a strength of 0.5 per cent. potassium-cyanide with 0.25 per cent. bromo-cyanogen, the gold-contents were reduced in five hours to about one-half, and in nine hours only 3dwt. remained in the exhausted tailings; but with cyanide alone, of 0.5 per cent. strength, the leaching of a similar bulk of ore was continued for six days, and the liquors were again and again renewed owing to the rapid consumption of cyanide. At the end of the week an assay showed that 3dwt. still remained in the tailings. They thus obtained, by a much similar expenditure of solvent, a far better extraction in nine hours than by six days of the MacArthur-Forrest process.

Hungarian pyrites concentrates: These had been partially roasted, but still contained about 70 per cent. of mixed sulphurets, and 2 to 3 per cent. of copper, assaying 11dwt. of gold. Twenty hours' leaching of Sulman-Teed solvent, at a basis of a 0.5 per cent. cyanide with bromo-cyanogen, reduced the tailings to 3dwt. The tests with plain cyanide alone afforded practically no reduction. A well-roasted sample of similar ore gave an original assay-value of 23dwt. of gold, and on treatment with the Sulman-Teed solvent it was reduced in twenty-four hours to 1dwt. 23gr., whilst by the MacArthur-Forrest process 12dwt. still remained in after thirty-six hours. This experiment was also on a scale of half a ton of ore.

A shaking-test upon a sample of Canadian arsenical pyrites was made with 0.3 per cent. potassium-cyanide, and also with a 0.3 per cent. potassium-cyanide, plus 0.12 bromo-cyanogen, and after half-an-hour's agitation with this ore, which originally assayed 7dwt. of gold, the yield with cyanide alone was 3dwt. 2gr., leaving 3dwt. 22gr. in the tailings; and by the addition of the 0.12 per cent. of bromo-cyanogen only 1dwt. 20gr. of gold was left, the extraction being 44 and 74 per cent. respectively.

Indian pyritical ore, assaying 10dwt. 12gr. of gold per ton, was submitted to treatment of potassium-cyanide solution of 0.2 per cent., and the same ore was submitted to 0.2 per cent. of potassium-cyanide with 0.08 per cent. of bromo-cyanogen, and after twelve hours' leaching the tailings from the first operation contained 9dwt. 18gr.; whilst in the second case the assay showed only 8gr. of gold, which proved the extraction to be 96 per cent.

Coolgardie ore, consisting of auriferous limonite to a value of 17dwt., was leached for fifteen hours with 0.3 per cent. of potassium-cyanide and 0.18 per cent. of bromo-cyanogen, and the tailings on assay showed that they contained 14gr. of gold, the extraction being equal to 96 per cent.

Australian pyrites-tailings, containing copper and antimony, having an assay-value of 10dwt. 12gr. of gold, on being leached for twenty-four hours with 0.45 per cent. of cyanide and 0.2 per cent. of bromo-cyanogen gave an extraction of 90.3 per cent.

South American tailings, containing large pyrites and a little galena coarsely crushed, showed by assay that they contained 6dwt. 13gr. of gold, and 7dwt. 20gr. of silver. Of this ore, 1cwt. was leached with 0.1 per cent. of potassium-cyanide and 0.5 per cent. of bromo-cyanogen, and after five hours' leaching the tailings gave an assay of 3dwt. 6gr. of gold, and 1dwt. 23gr. of silver. On leaving the ore in solution for another fourteen hours the tailings were reduced to 1dwt. 23gr. of silver, and 1dwt. 23gr. of gold.

In a trial with New Zealand silver- and gold-ores, having an original assay of 16dwt. of gold and 36oz. of silver, after twenty-four hours' leaching with 0.3 per cent. of bromo-cyanogen the tailings gave an assay of 1dwt. 4gr. gold and 25½oz. silver per ton. Another Australian ore which has, up to the present, given a great deal of trouble, and upon which the MacArthur-Forrest process has been tried unavailingly, is said to have been successfully treated by the Sulman-Teed process. This ore contained from 4 to 5 per cent. of copper, and a considerable quantity of antimony. The concentrates from this ore on an assay gave 1oz. 6dwt. 20gr. of gold, and, after fifteen hours' treatment with 0.5 per cent. of potassium-cyanide and 0.25 per cent. of bromo-cyanogen, the tailings showed by assay to contain only 1dwt. 4gr. of gold per ton.

Mr. Sulman, in describing his process for the manufacture of bromo of cyanogen, states that it could hardly be described as a secret one, but perhaps the substances from other suitable cyanogen basis by the action of bromine thereupon had overcome the initial difficulties experienced, especially with regard to the formation of para-cyanogen. The cost of bromo-cyanogen is set down as under 1s. 9d. per pound. Another element in the Sulman-Teed process is the treatment of slimes by using a certain percentage of soap; but further information as to cost, &c., will have to be obtained before anything can be said with regard to the commercial success of this treatment in its relation to poor ores. Mr. Sulman states that Dr. Teed and himself have tried their solvent upon masses of ore-tailings and concentrates of all kinds, most of them having been heavily pyritical, and often containing a considerable amount of copper, arsenic, and antimony. He also states that, in other cases, he obtained extractions from the unroasted substances, which approached commercial completeness, the average of gold obtained from tailings of concentrates of an ordinary richness being 1½dwt. Mr. Sulman further states that it is seldom, even in the case of pyrites concentrates, that more than twenty-four hours is necessary for a complete extraction of gold therefrom, whereas in the potassium-cyanide treatment of pyrites concentrates the time for treatment runs into weeks. Half a ton of Australian concentrates, mainly of iron-pyrites, but containing some copper and antimony, assaying 3oz. 15dwt. of gold per ton, yielded in five hours, with 0.3 per cent. solvent, 3oz. 10dwt. It is largely owing to the increased celerity of extraction, and to the non-production of caustic-potash as a necessary solvent reaction product, that we have been able to apply a solution containing potassic cyanide to gold-ores which have hitherto proved refractory to that agent, owing to the destruction of cyanogen thereby effected.

The caustic-potash, as formed in the ordinary process of cyanogen, is seen from the following equation,

