MYSTERIES OF MINING

This is the tenth in a series of features describing various interesting phases of mining and the mining industry.

Poisonous Cyanide has proven of inestimable help to the miner in his search for precious yellow gold. This drawing is the artist's portrayal of cyanide about to overcome the beautiful maiden who is symbolic of gold.

CYANIDATION

Many of the important discoveries in science were made accidentally; most others were the result of the development of primitive methods through years of constant labor. In the mining industry this has also been the case. Flotation, for example, was brought to light by a school teacher washing greasy ore sacks for her assayer-brother; the development of the modern grinding mills came from the laborious hand process of breaking up rich ores with hand rocks.

Strangely enough, what was probably the most important invention that the mining industry has ever received was made to order, at a time when it was needed desperately.

The world's gold mining industry had languished for many years when the discovery of the Rand goldfields, in 1886 stimulated world wide interest in the search for the precious yellow metal. However, it was soon learned that the Rand ores, while plentiful, were comparatively low in grade. The amalgamation process then in common use, employing cumbersome and noisy stamp mills as grinding medium, was cheap but extremely inefficient—a recovery of 60 per cent of the values was considered good. Many of the Rand ores, besides being low in grade, were found to be unsuited for treatment by amalgamation.

The logical solution, then, was the discovery of a new treatment for gold ores in general and the Rand ores in particular. The metallurgists of the time, with their meager knowledge, set to work upon the problem with zest—but their labors were of little avail. Dozens of proposals of one kind or another, most of them outrageously bogus, were eagerly grasped and tried.

Up to this time CYANIDE (a salt of prussic or hydrocyanic acid with the general symbol CN) was known only as a deadly poison, quite popular with the more subtle murderers, and of a little use in the infant arts of electro-plating and photography.

When, in 1887 three Englishmen, J. S. MacArthur, R. W. and W. Forrest, advanced a proposal to use potassium cyanide (KCN) as a solvent for gold, they were greeted with derision, chiefly because of the general lack of knowledge concerning the chemical.

Tests were soon made, however, and the new process was tried in New Zealand in 1889 and in South Africa; soon it was being used for the solution of both gold and silver ores without previous amalgamation. By 1925 cyanidation had become general practice in the gold and silver camps of the world. The process has been responsible for a very large proportion of the world's production of gold and silver. It is remarkably efficient; free-milling ore extractions as high as 95 per cent have been achieved.

The basic idea of cyanidation is to grind the gold ore in cyanide solution (usually potassium or sodium cyanide), to start the dissolution of the gold at once. Heavy steel ball or rod mills are used for the crushing process. The product of the grinding mill is then classified, and the over-sized particles returned to the mills for further working-over.

Air plays an important part in cyanidation. After grinding, the pulp (as the mixture of ore and cyanide solution is called) is discharged into large tanks (made of wood, steel or concrete) for agitation—which is simply a mechanical stirring during which air is forced through the entire mixture and the dissolution of the precious metals thus stimulated.

After the gold has been dissolved, the pulp is run to various types of filters, and the solution containing the gold and silver is separated. Zinc dust is then added to this solution, and the gold, silver, and other valuable metals precipitated. This precipitate is recovered by the use of a filter, which separates the solid precipitate from the barren solution by mechanical pressure. The black precipitate is then dried, mixed

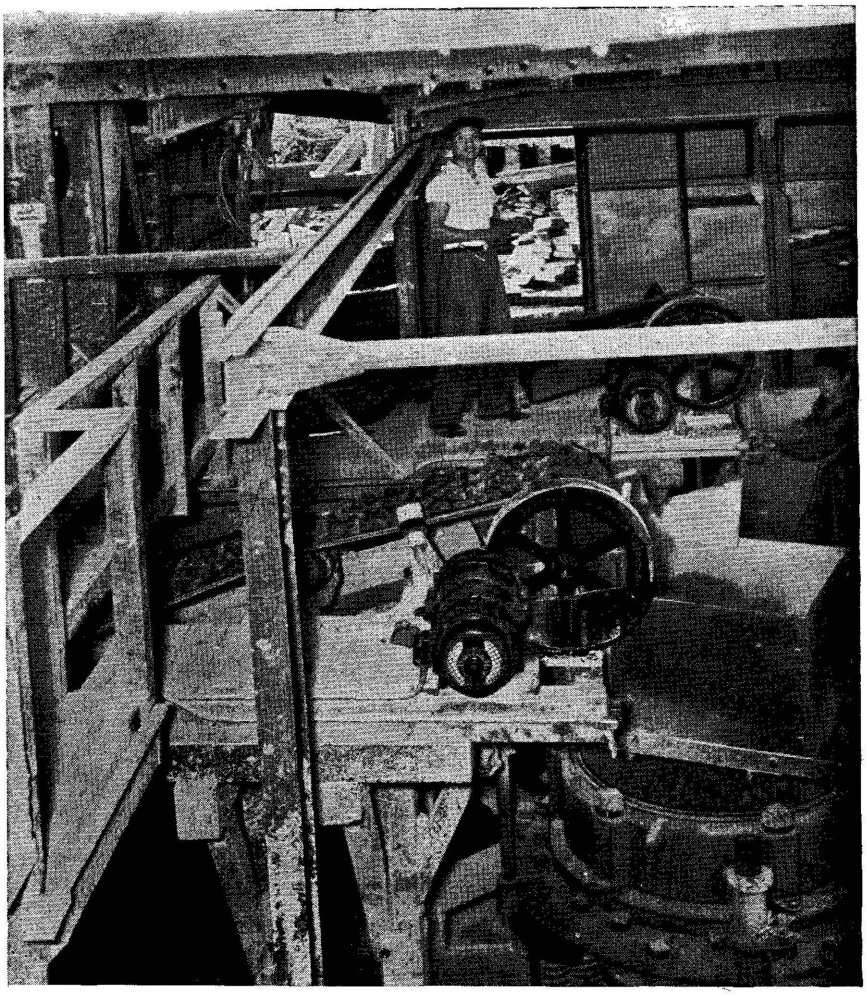
with flux materials, and smelted in a small furnace to remove impurities. The product of this operation is bullion, a concentrated brick of gold and silver, which is sent to the mint for further refinement.

That, in a nutshell, is the world's most productive process, in terms of gold and silver. There are many modifications of the process, and, of course, the operation of a cyanide plant is not as simple as it seem.

MINDANAO MINING COMPANY

Mindanao Mining Company produced ₱8,571 during September, from 36,067 cubic yards of gravel dredged.

In the Philippines, some 80 per cent of the five million pesos worth of gold recovered every month results from the use of cyanidation, either by itself or in combination with flotation, amalgamation, or mechanical concentration of one kind or another.



The first step in a cyanide operation. Ore going to the primary crushers, from which it will go to the ball mills to be ground in a cyanide solution.