The prolonged contact of caustic potash with many mineral sulphurates gives rise to alkaline sulphides and other cyanogen-destroying compounds, thus explaining the non-success by the ordinary process with the haloid-cyanogen solvent in which the haloid salt of potassium is formed as a reaction by-product, and this latter, being inert with relation to mineral sulphides, the former source of cyanogen loss is avoided.

In using soap for the treatment of slimes, the quantity required will, no doubt, depend on other salts found in the waters that are used, as some water becomes excessively hard from the presence of aluminium, manganese, &c. Mr. W. Betel, of South Africa, is said to have proved that the use of a small quantity of lime will have the same effect as soap, and only costs a mere fraction per ton, and by using it soap is not essential.

The Cyanide Process in the Transvaal Mines.

The *Engineering and Mining Journal*, of New York, has an interesting article on "The Cyanide Process in South Africa," which states that the recovery of gold by the use of cyanide in the Witwatersrand district is about 30 per cent. of the total yield from the mines. The methods of using this process may be of interest to mine-owners in New Zealand.

There are about fifty cyanide plants in the Witwatersrand district, of an aggregate treating-capacity of from 230,000 to 240,000 tons per month. There is a great variety both in size and design of the plants, although the general principal in all of them is the same. The objects which they have to fulfil consist briefly in : (*a*) Lixiviation of the ore-tailings or concentrates with weak solution of cyanide of potassium for the purpose of dissolving the gold ; (*b*) treatment of the solution to precipitate the dissolved gold in the metallic form. In all plants there are three main features : (1) Leaching- or filter-vats ; (2) launders for precipitation (zinc-boxes) ; (3) storage-vats for solutions.

The important difference between one plant and another may be said to consist in the material size and shape of the vats, the methods for charging and discharging the tailings, and the relative positions to each other of the leaching-vats, storage-vats, and zinc-boxes. As to the material for vats, the choice lies between brick, cement, concrete, and timber. For a permanent plant, or one which will have several years to run, either brick or concrete is probably preferable to timber; although, as far as is possible to judge, contact with the cyanide solutions does not appear to shorten the life of timber. As a brick or concrete tank may be considered as the watertight lining to a hole in the ground, which is the actual vat, the first essential in deciding the use of one of these materials is to find suitable ground to be excavated for a site. Any ground which is moderately firm and free from springs may be considered suitable. In case, as is usual, such brick or concrete tanks be constructed with their tops just level with the ground, the question of discharging is an important one. At the Langaagte Estate and Block B Companies' plants, where each circular vat is of a capacity of about 400 tons—40ft. in diameter and 10ft. deep—the discharging is very effectively and economically carried out by means of travelling-cranes, which lower the bodies of the empty trucks into the vats, there to be filled by the Kaffirs, and bringing them out full place them on their carriages to be wheeled away to the dump. A sketch is given in Fig. 1 showing the principal on which this is done. At the Crown Reef Company's new plant the square filter-vats are constructed of brick and cement, and measure 36ft. wide, 40ft. long, and 10ft. deep. These vats are provided with doors, through which the discharging trucks can be run into the vats, as shown in Fig. 2. In most cases, however, and especially for smaller plants, timber seems to be in favour, more particularly for filter-vats.

The sizes and shapes of filter-vats have been many and various. The present tendency is to restrict the number of vats and make them of a size limited only to the material available. In consequence of this, large size vats of a circular shape are selected as being the strongest. Wooden filter-vats have been constructed as large as 42ft. in diameter and 14ft. deep at the Sumner and Jack Company, and at the Durban-Roodepoort they are 40ft. in diameter and 7ft. deep. It is evident that there is economy in constructing large vats, as against the larger number of smaller ones of the same aggregate capacity. It is claimed, however, for deep filter-vats that they give a better extraction, and not without a certain show of reason. The larger the vats the more difficulty is experienced in discharging them, unless special appliances be adopted. When the vats are regularly constructed of a maximum diameter—of perhaps 20ft. diameter, with a depth of 5ft.—it is no great matter to throw the sand over the side into trucks, more particularly if the vats were square or oblong in shape. The adoption of special discharging facilities, such as bottom or side discharge for wooden vats, or the travelling-crane for buried brick vats, obviates the main drawback to large tanks. Sketches are annexed showing a bottom discharge, Fig. 4 being one patented by Mr. Charles Butters, and Fig. 5 is one designed by Mr. W. F. Irvine. The side discharge-door for wooden vats, Fig. 3, is a modification of a design made by Mr. W. R. Feldtmann. Another method of side discharge, designed by Mr. W. F. Irvine, is in use at the Crown Reef Company's fine cyanide works, where the large brick and cement vats are provided with doors which allow of the ingress of discharging trucks. The door frames are bolted to the cement walls, having an ingenious arrangement of sliding lugs with bolts and nuts. At the Barrett Company's plant, near Barberton, a system is in use of discharging through a door in the bottom into a launder, whence a copious stream of water carries the waste material into the creek below.

Details of the false bottoms of the leaching-vats are shown in Fig. 7. The false bottom, or filter consists of a wooden grating covered with two layers of jute and one of cocoanut-matting. The method of connecting drainpipes from leaching-vats is so arranged that solutions of different strengths may be drained from two separate vats simultaneously without mixing the weak and the strong.