[I]NNOVATIONS IN GRAVEL PUMP TREATMENT [P]LANT—I.

TREATING TIN IN MALAYA

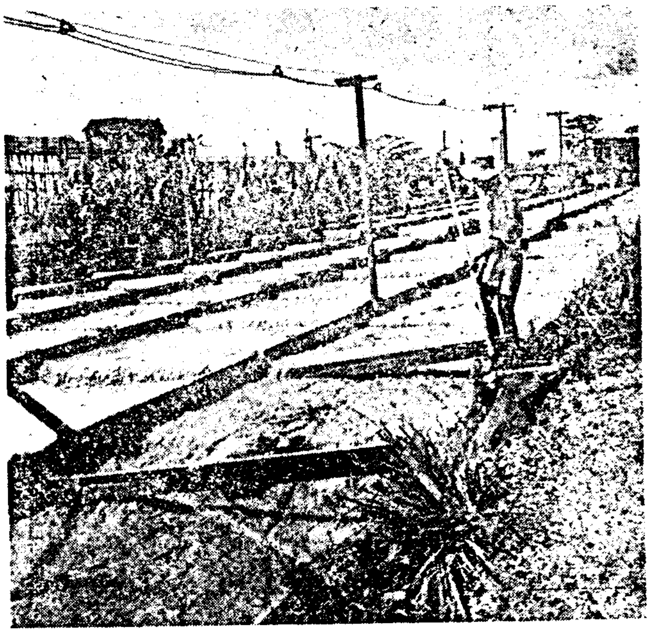
The following article, the first of a series, presents "Innovations in Treatment Plant for Gravel Pump Tin Mines in Malaya", by J. H. Harris, Chief Research Officer, Department of Mines, Federation of Malaya. The article, in its entirety, is published by permission of the Chief Inspector of Mines with the authority of the Minister of Natural Resources of the Federation.

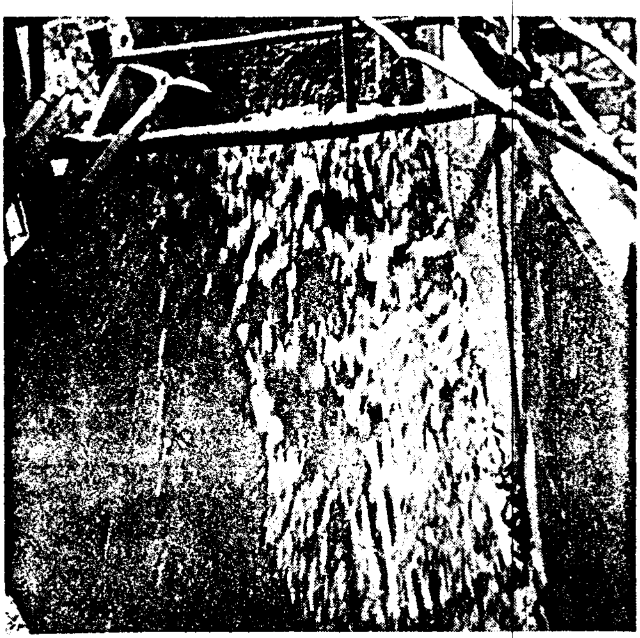
AN impression of a typical gravel pump, alluvial tin mine in Malaya can be obtained from the photograph above of the Leow Yan Sip mine, Menelai. Hydraulic monitors are used for breaking the ground, sometimes with the aid of mechanical excavators. The resulting slurry is elevated from the mine by means of a gravel pump or (now seldom) a hydraulic elevator, roughly screened on a stationary grizzly and run to a palong (sluice box) or jigs. In both cases losses of tin into the tailing are high. Evidence of this is to be found in the frequency with which old tailings are re-worked at a profit.

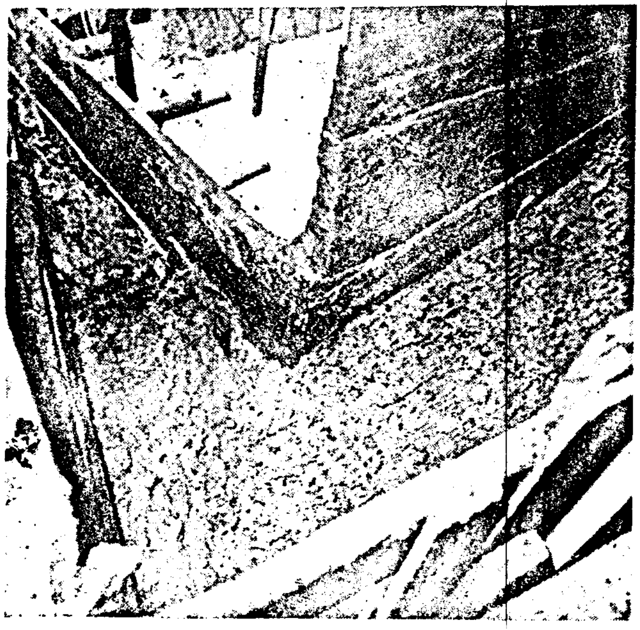
Use of Jigs

Recovery of cassiterite from the sluice boxes is effected either by hand washing or by running the contents of the box to a clean-up plant containing jigs. Where jigs are used as the primary recovery plant the practice is similar to that used on dredges and the locally designed Ruoss jig is commonly installed.

Sluices, or palong, in Malayan tin-winning operations







Above, the sieve-bend grizzly. Underflow launder in foreground handling 3,000 g.p.m. Bar spacing set to reject plus ¾-in. Swing deflector board, level with author's right hand, prevents loss of near-oversize by bouncing

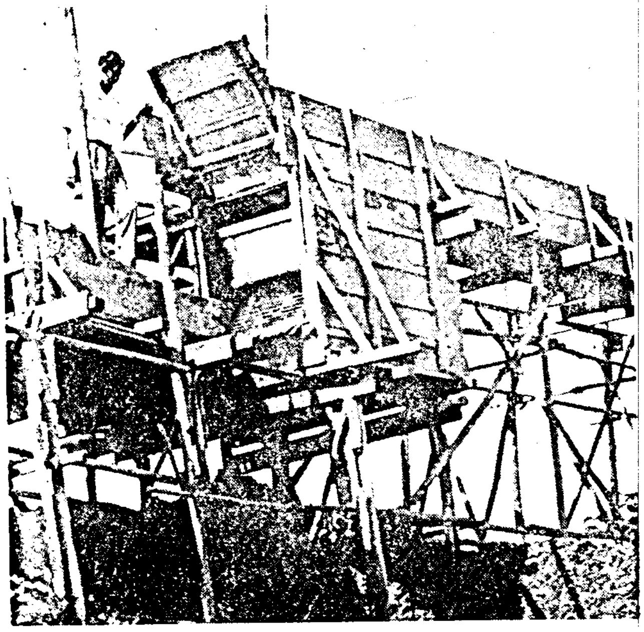
In 1956 the Research Division of the Malayan Department of Mines was asked to investigate if jigs could be used to recover tin lost in the tailing from the existing sluice boxes used at the mine illustrated. A preliminary test indicated that this could be done. The ground, which contained about 2 lb. of tin per cu. yd., was being worked at the rate of 15,000 cu. yds. per month. It carried a high proportion of slime and a crude system of de-sliming boxes was in use. It was evident that an improvement could be achieved if the de-sliming could be done more systematically and a regular feed passed to a jig plant, eliminating the sluice boxes completely.

It had been noted by the Research Division that the tin losses from existing sluice and jig installations in Malaya were aggravated by (a) excessive dilution and rate of feed and (b) the presence of excessive slimes which hinder settling and concentration of the cassiterite. The author therefore sought a method by which the feed could be economically and effectively de-slimed with as little loss as possible of recoverable cassiterite. The hydrocyclone offered the best possibilities in this connection but previous applications of this appliance in Malaya had involved the use of high pressures and a fine feed, factors not favourable to application on gravel pump mines.

Preliminary Work

A pilot plant was, however, set up at the mine in February, 1957, in which a portion of the gravel pump discharge, after having passed through the normal ¾-in. grizzly, was screened on a shaking screen at 5-mesh and

The illustrations at left show the old-style grizzly. At top, typical flow at 3,000 g.p.m. with ¾-in. bar spacing. In centre, a man constantly at work raking bars clear. Below, alongside, the result of the cessation of raking. Apertures blind and, at left of picture, pulp pours over to waste



The sieve-bend grizzly, a cheap, high-capacity, non-blinding, coarse wet screening device. The illustration above shows the use of the grizzly with practically dry oversize dropping to the rock pile below

pumped at about 10 p.s.i. to a 4-in. cyclone. The cyclone underflow was jigged with quite successful results. Tailings losses were low and were in the main confined to the extremely fine cassiterite (minus 300-mesh) in the cyclone overflow. It was evident that losses might also occur in the plus 5-mesh material and that in any case a more effective grizzly was required.

The Standard Grizzly

The grizzly currently employed in Malaya consists of an inclined set of mild steel bars spaced ½ in. apart over which the flow from the gravel pump is passed. It requires the constant attention of one man whose duty it is to rake the bars clear and ensure the diversion of oversize to a stone chute. Any blockage will result in large volumes of tin-bearing pulp being involuntarily diverted to waste.

The Sieve-Bend Grizzly

A solution to the problem of cheap, trouble-free wet screening for rejection of plus 1-in. material was found by utilizing the principle of the sieve-bend screen (which normally is not expected to handle material coarser than 8-mesh). The characteristics of this screen are high capacity per unit area without blinding since the size split is made at approximately *half* the aperture of the screen. A large sieve-bend was constructed of flat bars with a spacing of 2 in. and, after some experimentation with curvature, it was found that it did indeed work, without attention, as a non-blinding screen rejecting more or less dry oversize and delivering an undersize at a split of approximately 1 in. An increase of capacity of this screen was effected by preceding it, in the feed launder, by a horizontal grid with 1-in. spacing and the final screening was eventually set to 1 in. by spacing the bars 1½ in. apart.

Minerals Outlook in the Belgian Congo

The following article is extracted from a talk delivered on December 15, 1958, by H. Robiliart, managing director, Union Minière du Haut-Katanga, before the Belgian Chamber of Commerce in the United States.

THE Katanga, and more especially the Upper Katanga, is the Congo's most important mining centre, where several types of ores are extracted: copper, cobalt, zinc, cadmium, germanium, and precious metals, uranium, radium, manganese, tin, and also lead, iron and coal. It is there that most of the Congolese metallurgical plants are located.

With the exception of manganese ore and a part of the cassiterites, all these ores are concentrated on the spot. Part of the copper, cobalt, zinc, and cadmium, as well as tin, are refined in the Katanga. The copper zone comprises Union Minière's field of activities. Iron ore is mined only to the extent necessary to meet the requirements of copper metallurgy. Tin ore is mined in the North Katanga. There is a tin smelter at Manono. Coal mines are located in the same region, at Luena on the BCK Railway and at Greinerville on the shores of Lake Tanganyika. Manganese comes from Kisenge, near Dilolo on the Portuguese Angolan border.

Copper Area

The so-called copper region, which constitutes a small part of the Katanga, covers only ½ per cent of the total area of the Belgian Congo, but the value of its mine production in recent years has represented an average of about 75 per cent of the total value of Congo mine production. The remaining 25 per cent is accounted for as follows: tin and its associated metals, 8 per cent; diamonds, 7.7 per cent; manganese, 4.5 per cent; gold, 3.4 per cent.

In 1957, the Belgian Congo and Ruanda-Urundi together produced approximately 16,000 s.tons of tin. Tantalo-columbite and wolframite, of course, come as by-products of the mining of cassiterites. On the other hand, 374,000 oz. of gold have been produced, representing 1.3 per cent of world production. During the same year 407,000 s.tons of manganese ore were mined in the south-western part of the Katanga.

In regard to the Kasai diamonds, the group known as the Forminière Company has brought its plants up to a high degree of efficiency. In 1957, the Belgian Congo produced 15,600,000 carats (i.e. 80 per cent of world production), practically all of these stones being boart.

In 1957, the mines operated by Union Minière produced 265,000 s.tons of copper (8 per cent of world production), 9,000 s.tons of cobalt (60 per cent of world production), 207,000 s.tons of 57 per cent zinc concentrates, 129 s.tons of cadmium, 28,800 lb. of germanium oxide contained in concentrates, and 3,000,000 oz. of silver. Union Minière thus ranks as the fifth copper-producing company of the world, the largest cobalt producer, and one of the principal producers of germanium.

As fifth-ranking copper producing country of the Free World, the Belgian Congo has an economy which inevitably is sensitive to the evolution of the copper market. The crisis which the red metal experienced a year ago has had serious effects on the Congo's national income. It should be realized that a variation of 10 c. in the annual average price of 1 lb. of copper makes a difference in the value of