

easily mined generally. The tendency in the lower levels is towards more mineral sulphides and higher values; whilst throughout the whole there is considerable variance in the character of the free gold, sometimes being mostly coarse and at others almost microscopically fine, yet in all there is present some of the very fine gold. The ore in the middle and lower levels is, as a rule, hard, and more costly to mine than that of the upper levels. The variable condition of the ore often rendered the results of the treatment by cyanide alone very uncertain, as when the combination of conditions happened to predominate towards coarse gold and valuable sulphides the extraction would necessarily be low, even at the cost of very strong cyanide solutions and lengthened leaching, which would make an almost prohibitive cost under such conditions of treatment. A tolerably regular extraction could be maintained by blending all descriptions of ore; but this would only mean a deceptive improvement, for the coarse gold and valuable sulphides would still escape the cyanide, though in lesser ratio to the quantity of ore treated. Blankets save a large proportion of these values as very bulky and low-grade concentrates, generally too low-grade to admit of any more expensive treatment than berdan pan-grinding, which used to be the practice here. By this means almost all the free gold in these blanket-concentrates is amalgamated, and practically all the sulphide-values escape. Formerly the ore was treated by roasting and dry crushing. This method, though giving a good extraction, was very costly. Then crushing with cyanide solution in the mortars was adopted. This method did not give reliable results, as considerable coarse gold and almost all the sulphide-values escaped the cyanide. Concentration by blankets was used with both these methods, followed by amalgamation treatment of the low-grade blanket-concentrates in berdan pans. By this means all the amalgamable gold caught by the blankets was recovered, but coated gold and the valuable sulphides passed the berdans unrecovered; besides, there was much valuable concentrates which escaped the blankets entirely. The process now adopted is a combination process which, after careful and exhaustive investigation, was found to be most suitable and adapted to our ore. It is as follows: The ore, after passing through two Blake crushers, is elevated by a 12 in. belt elevator to the mill ore-bins. It is then fed to the forty stamps, which weigh about 850 lb. each, and strike 104 blows per minute, with a 6 in. drop. After passing through 30-mesh wire screens the pulp flows over amalgam plates, being then delivered to the elevator wheel, 34 ft. in diameter, and thus raised to the top of the mill. It now passes through a hydraulic sizer of the Spitzlutte type. The slimes are here separated from the sands, and treated separately from this on. The pulp now passes over the concentrating plant, and thence by launders is delivered to the rotary distributors in the cyanide-vats, to be treated by leaching with cyanide solution. The coarser amalgamable gold has been extracted by the plates; the concentrates, consisting of the sulphide-values and any coarser non-amalgamable gold, has been extracted by the vanners; and there is only left for the cyanide the finest gold and the most finely comminuted sulphide-values, which latter in this condition are much more amenable to cyanide treatment. The vanner plant consists of fourteen 6 ft. Union vanners and two 4 ft. Frue's. The overflow from the general cyanide-vats, whilst being filled, passes on by launders to the slime-vats, where the contained slime is settled with that previously separated by Spitzlutte. These slimes are then treated with weak cyanide solution by agitation, and good extraction effected. The concentrates from the vanners are also treated by agitation with extra-strong cyanide solution, and an extraction of over 93 per cent. of the bullion-value is maintained, at a cost of less than £1 per ton of concentrates treated. By actual experiment it is found that 75 per cent. of the values of the concentrates are quite unaffected by ordinary cyanide treatment, and therefore under that treatment would be lost. The principal points of the treatment are—(1) That the amalgamable bullion is at once extracted from the ore by amalgamation, the cheapest method of recovery; (2) that the non-amalgamable bullion and valuable sulphides are removed from the ore by concentration for separate treatment; (3) that the slimes are separated from the ore, and separately and rapidly treated with cyanide by agitation and decantation, effecting a good recovery; (4) that the remaining sands thus depleted of non-cyanidable values and obstructions to percolation are rapidly and perfectly treated by cyanide; (5) that the large quantity of water (from stamping, hydraulic-sizing, and concentration) which passes through the ore-pulp almost completely washes out the soluble cyanides, thus reducing the loss of cyanide by chemical decomposition."

*Crown Mine* (Area, 135 acres 1 rood 31 perches; owners, New Zealand Crown Mines Company, Limited; general manager, R. H. Daw; mine-manager, G. N. McGruer).—Operations to a very great extent have been carried on during the year. The adit-level and other levels have been extended, and a considerable amount of stoping done. Below the adit the underlay shaft has now reached a depth of 150 ft., and two levels opened out from it—No. 1 at a depth of 70 ft. and No. 2 at a depth of 140 ft. A chamber has been excavated above the adit and over the underlay shaft, and in this the winding machinery, which is driven by compressed air, is erected. Another shaft further in has been sunk from the adit, and has reached a depth of 140 ft. Towards this shaft the levels opened from No. 1 shaft are being driven, and, as the reef varies from 4 ft. to 16 ft. in width, extensive blocks will be opened, from which a very large quantity of quartz will be derived.

The quantity of quartz crushed for the year was 27,860 tons, which yielded 28,234 oz. 18 dwt., valued at £55,483 5s. 4d., and 180 men were employed. Developments in this mine have conclusively pointed out that quartz for several years' profitable work is available, and, as the battery consists of sixty stamps, the returns from this mine will help to increase the yield from the Ohinemuri district. The battery, which is now used in crushing with cyanide solution, is capable of putting through a much greater quantity than could possibly be done under the dry-crushing process.

*Talisman Mine* (Area, 60 acres; owner, New Zealand Talisman Gold-mining Company, Limited).—A large amount of development work has been carried out in this mine during the year. The reef has been driven on a considerable distance in the adit-levels. In consequence of the mine