

the improved physical condition of the sands, due to the introduction of the filters in the settling-tanks.

*Time of treatment.*—Before placing the filters in the distributing-tanks and obtaining the sands in a desirable condition, the average time occupied on each charge was 5 days 14 hours; after the change was made as above, the time occupied in treating 62 charges was 3,902 hours, or an average time of 2 days 15 hours. The results of this important saving of time were far-reaching; the capacity of the plant was nearly doubled; the percentage of extraction was improved (by improved percolation); and less solution was necessary, involving less decomposition and consumption of both cyanide and zinc.

*Consumption of material.*—During the periods under consideration, 2,423 tons of tailings were treated, with a total consumption of 4,977 lbs. of cyanide, costing \$1,360.65, and 950 lbs. of zinc, costing (uncut) \$123.50. The cost of cutting is included in the regular wages of the plant. These figures show that 2.05 lbs. of cyanide costing 54 cents, and 0.39 lbs. of zinc, costing 5.07 cts., were consumed per ton of tailings treated. Owing to various difficulties met with at the start, these figures do not exhibit what was being done when the process was running smoothly, and what can be relied upon in the future. During the month of July our consumption on tailings of the assay value of about \$10 per ton in gold was 1.25 lbs. of cyanide, costing 35 cents, and 0.25 lb. of zinc, costing 3.25 cents, making a total of 38.25 cents per ton. By careful and systematic work I believe an improvement on these figures might be realised.

*General working costs.*—The following table exhibits, in column 1, the actual working costs incurred in treating 2,423 tons from February to August. In column 2 are shown the costs which, from our past experience, I believe we can confidently anticipate when the plant is in regular working order and treating 40 tons per diem, which is a very moderate estimate of its capacity.

	ACTUAL AND ESTIMATED COSTS.	
	(1) Cts. per ton.	(2) Cts. per ton.
Foreman .....	28.8	9.7
Assistants .....	62.6	27.7
Assaying .....	16.5	5.5
Total wages .....	107.9	42.9
Cyanide .....	54.0	35.0
Zinc .....	5.0	3.0
Sulphuric acid .....	4.6	4.0
Assay and refinery .....	12.0	5.0
Fuel and sundries .....	5.3	2.0
	80.9	49.0
	\$1.88	\$0.92

*Precipitation in the zinc-boxes.*—For this purpose two series, each of 12 individual sheet-iron boxes, were used, with zinc shavings as the precipitating material. The shavings were cut on a Hampton zinc-lathe, which proved satisfactory, with little waste of zinc. The precipitation was very perfect, even when the solution was allowed to run as rapidly as possible. In all of the numerous assays which we took from the lowest of the zinc-boxes, we never once found gold of a greater value than 21 cents per ton of solution, and usually found only faint traces. When we commenced working, we kept the strong and weak solutions in separate gold-tanks; but we found that when the weak solution was below 0.05 per cent. in strength, the precipitation was imperfect and, on the other hand, when the strong solution was over 0.15 per cent. the consumption of zinc was excessive. We, therefore, partially mixed the so-

lutions so that the solution in the strong gold-tank should run about 0.10 or 0.12 per cent., and the solution in the weak gold-tank from 0.08 to 0.10 per cent. in cyanide. In this manner a perfect precipitation was obtained, with a much reduced consumption of zinc and cyanide in the zinc-boxes, and the strength of the solution in the strong sump-tank was maintained at about 0.08 and in the weak sump-tank at about 0.06 per cent. The solutions were thus kept at convenient strength for use as weak washes in the leaching-vats, and no waste of solution was incurred. During the passage of the solution through the zinc-boxes a heavy deposition of carbonate of lime takes place.

*Clean-up.*—Once a month the zinc-boxes were removed one by one to the chamber in which was placed the acid-tank, 6 feet 6 inches in diameter, and 2 feet 6 inches high. The zinc-boxes were thoroughly cleaned of slimes in this tank, and as much of the zinc was replaced as was thought desirable. The slimes were then settled with alum for 12 hours, and the water was siphoned off into a settling-tank. Hot water was then added, with sufficient acid to dissolve the zinc thoroughly. The liquor was then drained off through a filter box connected with the vacuum-pump. The filter material consisted of two woollen blankets and one canton-flannel sheet, firmly held in place by wooden cleats, and one canton-flannel filter, the sides of which came over the top of the box, loosely tacked in place. The slimes were then thoroughly washed with hot water and the washings were drained off through the filter-box. The slimes were then washed into the filter, drained dry, and removed bodily in the cloth; and the whole was dried on a pan fitted with a hood. The product was melted with an excess of silica in a graphite pot, and the resultant slag was melted with litharge and the lead was cupelled. The bar obtained by this process averaged about as follows: Gold, 548; silver, 294; base metals, 158 thousandths.

*Method of treatment.*—After repeated experiments we adopted the following as our standard method of treatment:

The strong-solution tank was filled from the sump and made up to the strength of 0.24 per cent. cyanide. This tank contained about 12.5 tons of solution. The charge to be treated consisted of about 35 tons of tailings. About 7 tons of solution was admitted onto the tailings. This quantity was sufficient to saturate the tailings and to allow the solution to stand about 6 inches deep on the top. They were allowed to soak thus for four hours. The outlet-cock was then opened and the solution was drained into one of the gold-tanks. The draining process occupied about half an hour. As the last of the solution was draining off, a sample was taken to be assayed for both gold and cyanide. The rest of the solution (about 5.5 tons) from the strong tank was then admitted, standing about 6 inches deep on the tailings, and they were allowed to soak for eight hours, after which the solution was drained off and sampled as before. In the meantime the weak-solution tank had been filled with solution from the strong sump, running about 0.08 in cyanide. This weak solution was then admitted (as required) to the tailings and the outlet-cock from the latter left open. In this manner the solution drained through rapidly, fresh solution being added whenever the surface of the tailings began to appear above the solution in the leaching-vat. When the last of the solution from the solution-tank had been admitted, the outlet-cock of the leaching-vat was closed. After the lapse of eight hours the cock was opened, and the solution drained off and sampled as before. In the meantime the solution-tank had been again filled, but