tailings. When we were treating oxidized ores, charges could not be successfully treated that carried over 45 per cent. of fines.

With all the stamps dropping, a vat was filled in from twenty-eight to thirty-two hours; but during the last quarter of 1902 it required from forty-eight to sixty hours. The experimental work called for five days' treatment; but, with the reduced crushing, we increased the proportion of slimes settled, and treated charges as long as our capacity allowed—the average time of treatment being 10.5 days. A normal charge was 185 tons, dry weight.

The acid tests seem, in the case of the Ymir tailings, to be worthless as an indicator for the use of lime. The ordinary tests for latent acidity called for over one pound of lime per ton. Phenolphthalein indicated more. We used 200 pounds to the charge for a while, until the zinc boxes grew so foul that dried precipitates assayed under 1,200 ounces of total fine bullion per ton. The methyl-orange indicator was more satisfactory. It called for less than 0.5 pound of lime per ton. But the final practice, which gave the best results, was to use less than 0.1 pound per ton, and apply it in 5-pound lots, the last lot going on with the final dose of strong solution. The cyanide consumption was thus reduced over 10 per cent.; and the zinc-box crude precipitates rose in grade to over 5,300 ounces per ton. In treatment, the final filtrates became very cloudy when they titrated between 0.1 per cent. and 0.05 per cent. KCN; and the small addition of lime, just before starting weak treatment, tended to keep the slimes coagulated and the filtrates clearer.

Vacuum percolation was soon discarded, as it gave a very dirty filtrate and packed the charges, so that the final rate of percolation was slower, even with the vacuum, than it would have been if unassisted throughout.

The routine of treatment was as follows:

After levelling and adding dry lime, two 5-ton doses of weak solution (between 0.1 per cent. and 0.05 per cent. KCN) are successively given. When these have disappeared they are followed by four or five 10-ton doses of strong solution (0.2 per cent.) at 5-hour intervals. There is no trace of cyanide in the filtrate for six hours after the first application of weak solution, and there are no values until after fifteen hours. After forty or fifty tons of strong treatment, the charge is drained six hours, when the filtrate has almost ceased, and titrates 0.04 per cent. to 0.07 per cent. KCN. Twenty tons of strong solution are now run in under the filter. It requires from six to eight hours to run this in without channeling the charge, and when it is all in, if drainage has been sufficient, there will not be more than 5 inches of solution on top of the charge. After soaking from three to six hours the charge is drained and a 10-ton top treatment follows. Top and bottom treatments thus alternate until 160 tons of strong solution has been applied. Then follows weak treatment, applied on top in 5-ton doses as rapidly as it disappears, to a total of forty or fifty tons. This is followed by wash solution (0.05 per cent. to trace KCN), forty tons; and this, by water as required, to preserve the balance of solutions or secure low end filtrates. No solution is run to waste other than which is lost as moisture in the residues.

The adoption of bottom treatment had a marked effect. During the first six months' operating, when only top treatment was used, the gold extraction gradually fell off from 70 per cent. to less than 50 per cent.; and assays from the bottom of the charges were discouraging. When the connections for bottom treatment were made in October the gold extraction rose at once from 48 per cent. in September to 75 per cent. for October; and the average actual gold recovery for the last quarter of the year was 80.23 per cent., while the actual silver recovery also rose from 25 per cent. to 41 per cent.

The total time of treatment was from 9.5 to 11.5 days. The average rate of percolation was 1 inch per hour, although 64 per cent. and 71 per cent. gold extraction were obtained from charges having only 0.5 inch and 0.6 inch rates. The highest rate during this period was 1.5 inch per hour. This slow percolation means high cyanide consumption and long treatment; but it also means larger slimes tonnage treated. It does not require a large increase in daily tonnage to pay for extra vats and a little more cyanide.

Residues are discharged through two 10-inch plug flanges placed 4 feet from the sides of the vats. A 2.5-inch hose with 2-inch nozzle is used under 115 pounds pressure, the hose being held in a swivel clamp at the edge of the vat. The bottom 6 inches is cleaned out at reduced pressure. One man will sluice out a charge and clean the filter in from 3.5 to 4 hours.

The filter is three thicknesses of 16-ounce burlap, having the usual false bottom and rope-grouting, and anchored to the vat bottom to counteract its buoyancy.

Precipitation is effected by zinc shavings in eight 10-compartment steel boxes, and it is perfect with the weakest solution when run at the rate of one ton of solution per twenty-four hours per cubic foot of shavings. The shavings in the wash solution box are lead dipped. Whenever there were values in the effluent, running at the normal rate, they were found to be due to precipitate mechanically carried over after dressing boxes, and it was found best not to disturb a box after it had been running more than a week, but to add shavings on top as required.

The clean-up method, while it just about competed with refiners' rates, was not satisfactory. The precipitate was dried, fluxed and smelted direct, without either acid or roasting treatment, and without refining, which produced a bullion of 720 total fineness. The treatment loss was 1 per cent. of the gold and 0.5 per cent. of the silver. The clean-up cost, including freight and treatment of the resulting high-grade zinc slag, was 17 cents per pound of dried slimes. This does not include charges for bullion treatment.

Operating costs per ton in detail for the last quarter, when 7,150 tons were treated, were as follows:

COST OF TREATMENT PER TON.

Cyanide, at $0.22 per pound	$0.200
Zinc, at $0.09 per pound	0.020
Lime, at $0.009 per pound	0.001
Fuel, at $2.50 per cord	0.019