

a further source of error may be introduced by wet ore sticking to the conveyor belt. With proper care at each observation, the time-volume, specific-gravity determination of weight gives results in which the probable error is less than would occur when weighing wet ore, on either platform or belt conveyor scales, in cases where a large correction for moisture has to be made.

General Conclusions.

The metallurgical extraction obtained on ore of 1/2-oz. grade is found to be over 95 per cent., of which approximately one-half is made by amalgamation under the present conditions of tube milling and stamping through 10-mesh screens.

Judged by the experience at the Dome it would seem that on low-grade Porcupine gold ore, even when tube mill grinding follows stamping, the recovery by amalgamation alone cannot be carried much above 75 per cent.

The cyanide process is admirably adapted for obtaining a high recovery at low operating cost. It still remains to be determined, however, whether or not the cheaper cost of operating a partial sand-leaching cyanide plant would not offset the additional extraction obtained by reducing all of the ore to slime in tube mills, and then filter-pressing the treated slime so produced. Experiments along these lines are now being conducted in conjunction with experiments to determine the feasibility of leaching slime in the Merrill filter presses, as is done at the Homestake mine where exceptionally low-grade ore can be profitably treated, by reason of the cheapness of operation and the high recovery obtained.

Discussion.

Mr. H. A. Megraw: (Communication to the Secretary:—Mr. D. L. H. Forbes' paper treating of the mill and process in use at the Dome mine, is an interesting addition to technical knowledge.

The matter of an adequate sampling and weighing system has not, to my knowledge, received any especial treatment at the Dome mill. This was one of the points to which I have called attention, and as I have devoted a special paper to the subject in general, it will not be necessary to go into detailed argument at this time. Evidently it has received the consideration of the Dome operators, as they are not likely to have overlooked so important a detail. It is probable that it is not considered economical to attempt exact sampling, the tailing assay from the filter presses showing the amount of loss and the exact percentage of recovery not being considered essential. Stamp crushing, followed by regrinding in tube mills, is the standard system used at the Dome mill, the only distinguishing feature being that the crushing and regrinding is carried out in water, while at most modern all-sliding mills it is done in solution to avoid the loss involved in changing from water to cyanide solution. The compelling reason in the case of the Dome is the necessity of using plate amalgamation for recovering as great a percentage of gold as possible before beginning cyanidation. The water crushing and plate amalgamation does not seem to be entirely justified at the Dome, but of course the question can only be settled by a comparison of costs. If amalgamation is considered necessary, there would seem to be no reason why it could

not be carried out as well in cyanide solution, as is done at the Liberty Bell mill, for instance; or if its primary object is the prompt recovery of coarse gold particles which would unduly delay cyanidation, one has only to consider the system in use at the Hollinger mill, treating ore of similar character, where the pulp is concentrated and the concentrate treated separately by cyanidation. Experience at the Hollinger seems to show that coarse-gold particles entering the tube mills are likely to stay there until thoroughly ground up and, most likely, dissolved. I have already mentioned the remarkable efficiency of the tube mill as a cyaniding machine, due to a combination of advantages, among which may be mentioned its receiving freshly precipitated, barren solution, which is extremely active, the grinding and agitating action and the slightly higher temperature generated by the friction within the mill. The grinding action of the pebbles and quartz sand ought to be particularly effective in abrading particles of gold. Mr. Forbes does not mention this subject in his paper, although it has doubtless been considered.

The Dome mill, while its installation was carefully considered as circumstances would permit, embodies a more or less tentative scheme of treatment. The necessity of promptness and the small amount of underground development, as explained by Mr. Forbes, account for this condition, while personal conversation with Mr. Merrill has confirmed it, he having indicated that with the information gained by the operation of the present mill, further expansion might be made the occasion for a change of the treatment system. Current information shows that the treatment is, in fact, to be substantially changed. The information at my command at this time is, unfortunately, not official or complete, but it is known that 40 additional stamps are to be installed, doubling the present stamping capacity, and that six 40 x 10 ft. leaching tanks will be put into use.

Here, then, is a most significant and far-reaching change; adopting separate treatment in place of total sliding. Hard as the Dome ore is, this seems a most reasonable and beneficial change, as the smaller recovery by leaching, if indeed it is smaller, will probably be more than offset by avoiding the regrinding to slime. It is most probable that the sand in the battery pump will be partially reground in the tube mills, again separated, and the clean sand leached. Whether more tube mills will be used, I do not know, but it seems likely that the present installation will be sufficient to reduce the increased quantity of sand to a size appropriate for leaching.

Whether or not there will be any change of the water-crushing system, does not appear at this time. In view of the fact that Mr. Merrill has secured such uniformly satisfactory results by water crushing at the Homestake, it seems likely that he would prefer to keep to that system. I have already mentioned that the use of water in the crushing system is believed, in some cases, to have advantages other than the presumed amalgamation obtained. In some Western districts, notably at Goldfield and Tonopah, operators believe that when solution is used in the crushing system, chemical combinations prejudicial to good cyanidation are formed which would be avoided were water used. These combinations are said to destroy cyanide. At Goldfield, water is used in crushing, but at Tonopah, where silver ores are treated, the loss of cyanide,