

amalgam has been removed, the copper plate is still found to carry a considerable quantity of gold and mercury, and upon being cut up and melted into a bar the value of the gold- and copper-contents amounts to more than twice the value of a new plate; hence the substitution of new plates for old is an expenditure which can be viewed without concern.

The results obtained from the foregoing treatment of the particular copper plate here specified were both interesting and of substantial value, the scale or accumulation of amalgam at the head of the plate being no less than 0.16 in. in thickness, and gradually decreasing to a bare $\frac{1}{16}$ in. at the lower end.

The total weight of the amalgam so recovered was 160 lb. avoirdupois, which, upon being retorted, yielded 60.5 lb., or 38 per cent., of crude bullion, and produced after melting a gold bar weighing 866.1 oz. troy, which, upon assay, proved to have a total fineness of 993.9, being 431.4 fine in gold and 562.5 fine in silver, and having a standard value of \$9.63 per ounce; thus making the total value of bullion recovered from the accumulated amalgam upon this one plate no less than \$8,340.54.

It may be remarked that the results recorded in this instance are not by any means exceptional. Other plates in this mill placed in service at the same time as the one forming the subject of this paper appear to be coated with an accumulation of amalgam of equal weight and value; and, moreover, within the writer's experience of other plates removed from this mill in past years is an instance in which one plate yielded accumulated amalgam in excess of \$11,000.

An examination of the facts observed in the course of cleaning this plate, and converting the amalgam into bullion, reveals one or two interesting features which appear to be worthy of record.

As stated above, the percentage of bullion in the amalgam obtained was 38 per cent., whereas the amalgam from the daily clean-up never contains more than 20 per cent. of bullion, and frequently not more than 10 per cent. This is, no doubt, due to the circumstance that the amalgam remaining upon the surface of the plate is subjected to greater compression than that which is cleaned off, and merely strained through canvas sacks.

The accumulated amalgam obtained from the plate in the shape of scale does not appear to suffer any visible alteration in form or size during the process of retorting. A piece $\frac{1}{8}$ in. thick and 1 in. square will pass through the ordeal of retorting, and emerge as crude bullion, having preserved, without apparent loss, its original dimensions, and still retaining on its surface any ripple-marks or imperfections which it bore during its existence as amalgam.

A comparison of the fineness of bullion obtained from the accumulation of amalgam upon this plate with the average fineness of bullion produced from the daily clean-up of the plate, during its service of three years and ten months, of which one would suppose the accumulated amalgam to be a fair sample, shows that, to a striking degree, this is not the case.

The average fineness of bullion obtained from daily clean-ups during the period mentioned was Au, 541.5; Ag, 443.9—total, 985.4: whereas the fineness of bullion obtained from the accumulation upon this plate during the same period was Au, 431.4; Ag, 562.5—total, 993.9: from which it will be observed that, although the total fineness of the latter—993.9—is greater than the fineness of the former—985.4—the gold fineness is 110.1 less and the silver fineness 118.6 more.

That the total fineness of bullion from the accumulated amalgam should be higher than that obtained from the daily clean-ups is not a matter for surprise, since the amalgam gathered from the plates from day to day would naturally contain a higher percentage of impurity and base metal than the amalgam which adhered to the surface of the plate; but it does not clearly appear why the gold fineness of the latter should be so much lower than that of the former, the difference being represented by a corresponding increase in the silver fineness.

In explanation of this inconsistent feature, it has been suggested that the native silver contained in the ore has a greater tendency to accumulate upon the plates than the free gold, owing to its stronger affinity with the amalgamated surface. If theory furnishes any authority for such a statement it is rudely disproved by actual experience in this particular instance; for test-samples of the accumulated amalgam from the head and tail of this plate prove the former to be 0.020 finer in gold than the latter, with a corresponding increase in the silver fineness of the amalgam from the lower end of the plate.

Furthermore, the amalgam saved upon the copper plates forming the distributor of the Frue vanners invariably shows, upon assay, a lower gold and a higher silver fineness than the bullion recovered from the treatment of the same ore upon the battery-plate; a sample of this vanner amalgam yielding bullion assaying—Au, 380.5; Ag, 602.0: total, 982.5. In other words, the silver, instead of showing a strong affinity with the amalgamated surface, gives evidence of a persistent tendency to escape amalgamation, as proved by the foregoing assays, which show that the gold fineness of bullion is highest nearest to the battery, and gives place to a steadily-increasing silver fineness as the amalgam is deposited upon the copper plates at greater distance from the battery-discharge.

The natural conclusion to be drawn from these facts and figures would justify the expectation that the bullion derived from the accumulation of amalgam on copper plates would be of equal (if not of higher) gold fineness to that recovered from the daily clean-ups upon the plates during the period in which the accumulation was in progress. The foregoing facts, however, incontestably prove that such is not the case; and the purpose of this paper will be served if the facts herein presented, which have been prepared with due regard to accuracy, are the means of suggesting an explanation of this interesting inconsistency, which the writer most frankly confesses himself unable to supply.