

SUMMARY.

1. The process saves the finest slime or float mineral, free gold, sulphides, or tellurides, &c., which is the chief source of loss in water-concentration plants, and will separate such mineral even when the same is of less specific gravity than the gangue it occurs in.

2. It can be used after any system of wet crushing, without classification, on material finer than 20-mesh (400 holes to square inch), or can be added to existing concentration-mills for the treatment of the slimes which carry off value; it is thus specially adapted to the saving of "float losses." The grade (mesh) of crushing necessitated will, of course, depend in each case upon the degree of fineness and dissemination of the values through the matrix of the ore, and the ease with which these can be detached therefrom during crushing.

3. The pulp flows automatically and continuously through the mixers without attention, and the oil passes continuously from the surface of the spitzkastens below mixers into the centrifugal machines, and thence, freed from concentrates, is pumped back into circulation again through tanks feeding the mixers. The discharge of concentrates from the centrifugal machines involves extremely little labour. The power required is very small, being simply that to revolve the mixers and to run two centrifugal machines for several sets of mixers.

4. The cost of installation is not relatively high for a plant in which the capacity is at least 50 tons per day. The floor-space occupied is very small.

5. The cost of operating is very low, and wear-and-tear as little as any running machinery will admit of.

6. The quantity of water necessary per ton of ore is small, and, by settling, this can be used over again, except, perhaps, where amalgamation is used before concentration. Mine-waters, even where acid or charged with soluble salts, can be generally employed.

7. Clean concentrates are produced almost free from rocky particles, but containing a small percentage of oil, which is no disadvantage for smelting or roasting, and assists in briquetting if this be desirable.

8. Certain minerals can be separated from others of similar or greater specific gravity. For instance, copper-pyrites can be taken from magnetite, which is impossible by water concentration, and very imperfectly accomplished by magnetic separation, however slowly and carefully concentrated.

9. Although oil is used freely in the process, the whole plant and building can be kept absolutely clean and neat, owing to the perfection of the mechanical appliances as now developed. The total loss of oil depends in part on percentage of concentrates, and may be taken at from 1 to 3 gallons per ton of ore.

10. The plant is constructed in very convenient units of about 25 tons daily capacity, but depending on character of ore, and can be easily added to when installed.

11. The concentration depends on the surface condition of the material, and generally it may be said that metallic surfaces are attachable to the oil, and earthy surfaces not. Nevertheless, sulphur, earthy-looking cinnabar, graphite, molybdenite, atacamite, and some other minerals, which in advance might not seem to possess promising surfaces, are most successfully taken up by the oil. Tellurides which are difficult to concentrate by water, and from their gold and silver values need close saving, are easily concentrated by this process. Some oxidized gold-ores in which the metal is so fine as to defy amalgamation have given good results. Average basket gold-ore from the Rand mines without any previous amalgamation has yielded a high extraction and rich concentrate. These last three classes promise a field for the process in direct competition or in conjunction with cyaniding. As it is desirable to extend the knowledge of its application, correspondence is invited, and samples will be received for laboratory testing by the process, in cases where difficulty or loss occurs in existing methods of concentrating or cyaniding.

12. Where an ore is heavily mineralised the adoption of the oil process by no means precludes the employment of water-concentration plant, especially where such is already installed. The contrary is indeed the case, water- and oil-concentration systems being frequently capable of advantageous combination, the former supplementing the latter and rendering it more efficient. By the addition of an oil-concentration installation to water-concentration plant, not only are all float losses (more or less inevitable with water concentration) effectually recovered, but the capacity of the wet-concentration system is greatly increased.

The vanners, Wilfry tables, &c., would not need to be run as close concentrators, but employed merely to yield a large proportion of the mineral as sharp "heads," all middlings, tailings, and slimes being passed through the oil plant for the complete recovery of the balance of values. The total saving by the combination is greater than possible with the most perfect water-dressing system alone, whilst the economy is dual—that of the water-concentration plant being increased by freeing it from the necessity of close separation, thereby utilising its maximum ore-capacity, and that of the oil plant by relief from the need of dealing with a large proportion of the coarser material.

13. Where gold occurs both finely disseminated through the quartz or other ore matrix, and also in association with pyrites, tellurides, or refractory minerals, the oil process offers a ready means of treatment. The mineralised values are thereby obtained in a high degree of concentration available for smelting recovery, or for roasting with subsequent chlorination, cyaniding, &c., whilst the residual values (if any) in the siliceous tailings are obtained in a condition readily recoverable by ordinary cyanidation. Thus the bulk of an ore otherwise unsuited to direct leaching extraction may be so treated after the removal of the refractory contents by means of the oil-concentrating process. Notably is this so in the case of tellurides and sulpho-tellurides and copper compounds.

14. The readiness with which the finest mineral particles are retained by oil renders possible in many instances the simultaneous recovery of slimes values with the concentration of the coarser ore, and will thus often obviate the need for subsequent slime-treatment plant, filter-presses, &c.;