

machine is also found desirable below the first, to separate the last of the oil and water from the concentrates. The concentrates are left in the machine, practically dry and free from oil.

The Glasdir Mine was originally equipped with one of the most modern concentrating-mills obtainable, which was worked in the best possible manner under the direct personal supervision of able experts: Over 52,000 tons of ore from the Glasdir Mine were treated by the jig and Luhrig table plant referred to, with a result that only 14.5 per cent. average value recovery could be obtained from the ore. The Glasdir Company secured the services of expert managers from Germany and Cornwall, as well as from America, and gave the mill every chance to show its best performance. During the time the various experts sought to remedy the defects in the dressing and concentrating process which had been established at so great an expense; almost every known mechanical appliance was tried in turn to see if a reasonable recovery could be got from this ore, but without success, owing to the large proportion of float and slime material produced. Magnetic separation was considered and tried, but with negative results; several chemical processes were tested, and in turn abandoned, owing to great cost or poor recovery. It was found that the disastrous loss arose largely from the very friable nature of the pyrites.

The process was first tried in the laboratory, then on a small working-scale, and then with a plant erected at the Glasdir Mine capable of treating about 50 tons of ore per week. After a lengthened trial of this plant a larger one was erected, which gave eminently satisfactory results when treating 100 tons per week. From the experience gained from working this last-named installation the existing plant was designed, which is a thoroughly practical working equipment in every respect, treating 250 tons of ore weekly. The recovery of over 80 per cent. of the metallic values from the Glasdir ore by the new process having been fully demonstrated, the whole of the original jig and Luhrig table plant has been abandoned in favour of the new plant.

The Elmore ore-concentration process has already been investigated and favourably reported upon by several eminent experts. Mr. Charles M. Rolker, M.I.M.M., the well-known mining engineer, made an exhaustive examination, and in a paper which he read upon this process before the Institution of Mining and Metallurgy said, "The mechanical contrivances brought into action by the inventor are excellently adapted to the work demanded, and bespeak very careful thought, as well as patient, systematic, and highly intelligent work. Seemingly insuperable mechanical difficulties in the initial stage have been very ingeniously overcome, and the process has arrived at a practical working-stage." Mr. J. H. Collins, F.G.S., past president of the Institute of Mining and Metallurgy, and formerly chief chemist and metallurgist of the Rio Tinto Company (Limited), in his report upon another mine, the ore from which was treated at Glasdir by the Elmore process, says, in reference to the process, "It is not my province here to report upon this process in detail, but I feel bound to say that in my opinion it will open a new era in the treatment of tender sulphuret ores." The plant of the Glasdir Mine has recently been studied by mining experts connected with some of the largest and best-known mines, with the result that the process is about to be applied to low-grade ores in different parts of the world where such ores have heretofore been found impossible to work at a profit, and it is anticipated that, by the use of the Elmore process, in the near future some mines which have been either standing idle or have been worked at a loss will become successful.

Experiments have shown that on auriferous antimony, cinnabar, and molybdenum ores, the sliming properties of which are such as to preclude the possibility of their being concentrated commercially by water, the process gives a very high extraction and rich concentrates. Some copper-ores from South Africa which have been very wastefully treated in the past, owing to difficulties in concentration caused by the presence of magnetite, have been in small tests enriched from 6 to 40 per cent. of copper. Another copper-ore from Mexico in which the presence of heavy garnets interferes greatly with concentration of the auriferous copper minerals has given a concentrate of 23 per cent. copper from mill tailings. In both these cases the final tailings after the oil process were very poor. Free gold seems easily caught by the oil even when quite coarse. There may be no advantage on such material over existing processes, but late experiments indicate a successful application even to very fine gold. Some of the copper-ores from the Mount Lyell district and from British Columbia seem particularly well adapted to the treatment. A much larger number of tests than is here indicated have been made, but those quoted will suffice as showing the variety of ores the process has successfully treated, and experiments with telluride and sulphide ores from Western Australia have been made with very satisfactory results, inasmuch as the oil is found to effect a practically complete extraction of the sulpho-telluride contents of the ore. Detailed results of a number of tests are given herewith in the tabulated statement on the next page, to which special attention is directed.

The process has a great future, particularly in cases of difficulty by water concentration arising from brittleness or lightness of minerals to be separated, or from heavy gangue accompanying the minerals, such as heavy spar, magnetite, garnets, rhodonite, &c. It does not seem to matter how finely the mineral breaks; if it is a mere scum on the water-surface, contact with the oil in the agitating-cylinders appears to assure recovery of the float values. Where water is scarce the process has a great advantage, for the rock can be crushed with the minimum quantity used in regular wet stamping, and by settling can be used over again, as muddiness of the returned water is no disadvantage. In practice it has been found at Glasdir that very little attention is required for the control of the process; that considerable variations in quantity of oil-supply and temperature are allowable; and unskilled labour can be used under the ordinary intelligent superintendence necessary in any mill. The plant is much simpler than that of an ordinary concentration-mill; is not expensive to install; is subject to little or no wear-and-tear; and can be put below any wet-crushing machinery. In existing mills where heavy loss in slimes occurs this process can be easily added as an auxiliary plant. Material as coarse as 20-mesh has been concentrated.

The loss of oil has been found to be at Glasdir  $1\frac{1}{2}$  gallons per ton of ore treated, and may be taken as varying, according to ore and other conditions, between 1 and 3 gallons per ton. The oil is of a very cheap class; its cost may almost be said to be the cost of transport to any particular place.