

Both these operations are not, however, very easy ones, but require, for profitable and satisfactory execution, much care, favourable natural conditions, and a considerable amount of capital in the construction of the necessary works. The saving operation has to be effected at each single crushing mill, and for it the so-called Borlase's buddle, with Munday's patent scrapers, is the most approved in Victoria; but where capital and favourable conditions are wanting for the erection of these rather cumbersome machines, the use of a good length of blanket strakes—say 20 to 30 feet—and careful attention to and more frequent washing of the blankets than hitherto practised, would at least save the greater quantity of the pyrites. With regard to the after treatment of the latter for the extraction of the gold, roasting furnaces and certain kinds of amalgamators are required, the working of which has to be specially learned. In fact, it may be said to constitute a special industry, which not every company or reef-owner might care or be able to enter into. In Victoria nearly all the larger companies have their own pyrites works, but there are also special private establishments of the kind, unconnected with crushing mills, at which miners or companies can either have their pyrites treated at a fixed rate per ton, or can sell it at a certain reduction on its gold value, which latter is ascertained by careful metallurgical sample assay. A similar course must be left for private enterprise to follow in Otago.

In view of the fact that in the reefs of Victoria—and this, as already stated, will most likely also happen in the reefs of Otago—the pyrites generally increases in quantity in depth, whilst the free gold correspondingly decreases, and that, moreover, the latter is the more difficult to save the more pyrites the stuff contains, the pyrites question, as it is called—referring to the best modes of concentration and after treatment of the ore, sanitary precautions connected with the roasting, &c.—has there for years been one of increasing importance, and the Government appointed some time ago a Commission to fully investigate the subject in all its bearings. The recently published report of this Commission contains full information, with drawings of machinery, &c., on the best methods of pyrites concentration, and gold extraction, and as, if I entered upon a description of the respective processes, I should merely have to recount what is stated in it, I append a copy of this report instead. Considering, in conclusion, the general working effect of the crushing machines throughout the gold fields of the province, there are two serious natural disadvantages under which all suffer, though some in a stronger degree than others. I refer to the hard frost in winter, and the general low temperature of the water throughout the greater part of the year. The former compels the actual stoppage of the works for several months (five or six months at Skipper's Creek); the latter affects the liveness of the quicksilver, and thereby impairs, as it were, its amalgamating power. Against the first nothing can be done, and to ameliorate the second difficulty the introduction of hot water into the coffer can only conveniently be practised at those machines driven by steam engines. However, I think that, whilst the introduction of long blanket-strakes would prove a great safeguard against any loss of gold caused by imperfect amalgamation, the most rational way to meet the frost difficulty would be to have all parts of the machinery sound and in best working order, so as to guard against interruptions in crushing day and night through the summer months, in order to work up as well the crushing material accumulated during winter stoppage, as also that concurrently produced.

#### AURIFEROUS DRIFTS.

On this head I have only to record some observations that my time allowed me to make, whilst travelling between the different quartz mining centres. Not having seen enough, therefore, to attempt any geological classification of the drifts, I will simply separate them into "newer" and "older," "upper" and "lower" drifts, as the case may be—main divisions, the existence of which everyone interested in the matter will easily recognize on visiting the gold fields.

*Newer Drift.*—Under this head belong all those extensive striking terrace formations of shingle and sand, and a certain thickness, running from a few to perhaps over 100 feet of the flat stratum of similar material on which they rest, accumulated in those far-stretching, wide portions of the present river-valleys, the original character of which as lake-basins has long been recognized. The terrace formations of shingle, &c., resting on the rock of the ranges, fringing the valleys, the drift occurring in the smaller valleys or gullies between the ranges and the real drift, are also here included. Besides the extensive sluicing operations which I saw executed in this drift along the banks of the Molyneux, Kawarau, and Shotover Rivers, the really grand scale on which hydraulic sluicing is carried on at Tinker's (Blue Duck Claim—manager, Mr. J. Spratt) and Drybread diggings excited most of my admiration. To give an idea of the scale, I may mention that, at Drybread, Greenbank and Company use forty sluice-heads of water with a mean vertical pressure of 130 feet, lessened about 25 feet through friction in the pipes, and have 4,500 feet of iron piping, besides an expensive stock of necessary appurtenances on the ground. Although the stuff washed is very poor, still the enormous quantity sluiced through in a short time, work being carried on day and night, renders the operation highly profitable. Work like this is entirely unknown in Victoria; perhaps the only other place in the world where it is practised being California. The thickness of the drift which rests on the so-called "Maori Bottom" surpassed, in some places, 30 feet, and considering this in connection with the promiscuous way in which patches of it are worked along the foot of the Dunstan Range, though the generality are in front of, or near, the mouths of large permanent creek-valleys, one cannot help coming to the conclusion that the gold extends all along the foot of that range, the richer accumulations existing most probably in front of where the latter is most broken by rifts and gullies, whilst towards the centre of the wide valleys it no doubt decreases in quantity, owing to causes to be explained further on. And the same chance I believe exists not only along the foot of the range on the opposite side of the wide valley, but also round the edges of all the other large old lake-basins. In fact, the resources of the province in this kind of auriferous drift alone are practically inexhaustible, and their successful development only requires more of the enterprise and energy, as displayed by Greenbank and Company, in rendering the splendid water resources of the province available for hydraulic sluicing. As some of the places which I consider very promising, and certainly deserving of the special attention of the drift miner, I may mention the part of the old Clutha lake-basin in the angle where the Bendigo Creek enters, and along