

fact that the telegraph road, by opening a way into the interior, has served as a base line for exploration. Beyond the Driffield all exploration in a southerly direction will be barren in results; possibly, however, there may be some small inliers of metamorphic rocks in the deeply excavated channels of some of the rivers flowing southward. Such probable inlier is on the Katherine, some forty miles north-east from the telegraph line. It is a fortunate circumstance that the general direction of the northern portion of the projected transcontinental railway, as determined by topographical features, will traverse the whole of the mineral fields, so that an independent line of railway constructed to overcome some of the difficulties which impede mining development may in the future become an integral part of a great railway system. For immediate purposes it need not be carried further than Pine Creek, and most certainly not beyond the Driffield.

#### GOLD REEFS.

The gold-fields extend from the River Stapleton, via Bridge Creek, the Howley, Port Darwin Camp, Twelve-mile McKinlay River, and the Union to Pine Creek, a distance of sixty-five miles, and thence to the Driffield, thirty-five miles further. The last-named district was not visited by me, but all the chief workings in the others were inspected; these are coloured in gold on the accompanying map of the metalliferous district. The width of the auriferous country as at present known is only a few miles. The chief centres of gold-reefing are the Howley, Twelve-Mile McKinlay, the Union, and Pine Creek. The quartz veins are included in the felspathose sandstones forming the high ground; and because they intersect the "country" at angles approximating to the strike of the rocks they have contributed to the ridge-like form of the ranges. In some cases the crest of the range coincides with the outcrop of a quartz vein of two feet or so in thickness; this phenomenon is well exemplified at the Union, where one reef is traceable along the summit of the range for over two miles; in other cases, a close series of strings of quartz determines the outline and direction of the ridge. Many of the hills carry one or many quartz reefs, the majority of which are auriferous, most particularly are the smaller veins and strings rich in gold. From "prospects" taken at random, I have no reason to doubt the statements made that the yield from them is from four to six,

and even twelve, ounces per ton. Were these reefs located in a country better circumstanced, they would have been made to yield handsome profits. An unfortunate feature of most of the auriferous lodes is that the gold is compressed into a small compass; whereas, if it were disseminated throughout a wider and more solid body of stone, there is no doubt it would be easier and more profitably extracted, and offer less uncertainty as to its permanence. Quartz-reefing is chiefly carried on by small parties, whose capital is their bone and sinew. The returns for a time are large, but, on encountering water or other impediments, which bring down the earnings, the reef is abandoned in order that the same process may be repeated elsewhere. In this way the multiplicity of auriferous reefs has been a comparative disadvantage, as very few of them have been followed to any depth. The mining operations are of the simplest kind. The quartz is raised to the surface in buckets by hand windlass. There are only two pumping-engines on the whole field. The period at which the bulk of the quartz veins can be advantageously worked will not entirely depend on their yield, but will be more or less influenced by the general price of labour and the materials in the district. The supply and consequent price of labour is materially influenced by the distance at which the gold-fields are situated from the great centres of trade. The history of gold-mining in Victoria offers a striking illustration of these axioms. Year by year the amount of gold derived from the working of gold-quartz has gone on gradually and rapidly increasing, as, by the introduction of efficient and powerful machinery, ores of a very low produce are treated with advantage; but in this connection it must be observed that to obtain a satisfactory profit it is necessary not only that large quantities of ore should be treated, but also that the greatest economy should be observed in every department of the manipulation. To develop the gold resources of the Northern Territory it is necessary that more capital be introduced, to be chiefly applied to improved machinery for the extraction of the gold, and to cope with water; more experienced and honest management be secured, and a reduction of working expenses be effected. The batteries which I examined are discreditable; they are all the same pattern, and no attempt has been made to adapt them to particular requirements. There is a total absence of labour-saving appliances. All the batteries which I saw at work are in the highest degree wasteful; the slimes in every case are highly charged with amalgam; and no attempt is made to save the auriferous pyrites, as indeed no appliances are in use for their treatment. I do not hesitate to estimate the loss of gold at from 50 to 75 per cent., involving among other disadvantages a loss of considerable revenue to the State. If to the above fact we add that the price of carting and crushing has been hitherto at the rate of £3 10s. to £4 per ton, and that the wages of the skilled miner are £5 per week, and that the gold realizes only about £3 6s. per ounce, there can be no reason for wonder

that quartz reefs carrying an average of 3 oz. of gold per ton are barely remunerative. It must be obvious that unless the quartz is really good our gold mines could never have kept so many men employed with these expensive appliances for so long a time. I have diligently sought for and enquired after memorials justifying the expenditure of those large sums of money which were raised some few years ago in Adelaide for the purpose of working the auriferous reefs in the Northern Territory; but it is with a mingled sense of shame and pleasure that I have to record that they exist only in the shape of a few primitive stamping batteries. The very limited exploitation that had been done on a few mines is hardly deserving of being placed to the credit of the enterprise. The sense of shame is experienced when we consider the misapplication of capital by the local managements; that of pleasure on finding that the disrepute into which this auriferous field has been brought cannot be attached to the gold properties themselves—indeed those of the abandoned mines which have subsequently been worked by private capital have proved remunerative. It is a notorious fact that few, if any, gold properties in the tropics have been made remunerative under skilled white labour—and no wonder, if it be conceded that a tropical climate is unsuited for Europeans to work in. But mines employing native labour, with a minimum number of European overseers, compatible with successful and economic exploitation, have yielded steady profits to the proprietors. The St. John del Rey Mine, in the Brazils, makes a noble profit with a quarter of an ounce of gold per ton. To reduce the working expenses of our gold mines it is imperative that we employ cheaper labour—that of Chinese or negroes.

#### ALLUVIAL GOLD-FIELDS.

These are located in the immediate vicinity of the auriferous reefs, and occupy the lower slopes and bottoms of the short gullies which feather in and out among the ranges. There the "pay-dirt" lies on the surface, or rarely at a greater depth than two feet. It is obviously of local origin. Here and there the gold has been retained in pocket-like depressions fronting rocky barriers across the gullies, from which considerable stores of the precious metal have been obtained. The main lines of drainage into which these gullies lead have not been systematically prospected, and it is a moot question whether or no the broad valleys have "pay-dirt" beneath them. The ground may easily be tested, as there seems to be a very limited depth of drift-deposit filling the depressed surfaces—indeed, the slight rises on the plains are all composed of bed rock. The deepest accumulation of drift that I saw on the south flank of Mount Carr, where it is cut through by the Adelaide River, is not more than twenty-five feet. The bed of the river is composed of metamorphic rock. But as long as rich gold shall continue to be found in shallow ground, as long shall we despair of the deep ground being tried, or the auriferous reefs being energetically prospected. Although some of the diggings have yielded well, I cannot regard the Northern Territory as much of an alluvial field. The limited areas of the diggings and the inability to work them, through lack of water, for more than a few months in the year, foster a nomadism among the miners which is inimical to permanent settlement of the country. Considering the primitive methods employed for gold-washing (I saw in use only the tin dish and small cradles), I have no doubt that the employment of more efficient appliances will result in very much larger returns of gold than have hitherto been obtained; even the residuum of the deserted gold-fields may be again gone over with profitable results.

Stream-tin was seen *in situ* at two places ten miles apart in a straight line. These are shown by red streaks on the mineral map, but samples of tinstone were inspected, which were reported to have been obtained at other localities than those visited. The first site is the gravelly bed and east bank of one of the tributaries of the McKinlay River. Good prospects were obtained here. The tinstone is well rounded, but the pebbles do not exceed half an inch in diameter. As prospecting was limited to two holes near to each other it is impossible to arrive at any approximate estimate of the quantity of stream-tin that is here present. One excavation is 20 feet by 30 feet, and 6 feet in depth, from which, it is said, 11 cwt. of tinstone was taken. On following up stream the rocky walls come together at a distance of 200 yards, but what is the character down stream beyond the excavations could not be ascertained. The gravel in the bed of the creek is well rounded, and consists of silicious talcose slate and hornblendic schist, identical with the material composing the rocky walls of the gorge. No trace of granite *débris* was observed, though searched for. The other site of tinstone was near the head waters of a stream which drains a boggy flat, and flows north along the east flank of Mount Wells. The bed of the stream is at first gravelly, and here fair prospects of stream-tin were obtained. Other holes, embracing a distance of about one quarter of a mile, yielded similar results, but from this point the fall is rapid, and the detritus is in the form of large boulders only. Unless tinstone occurs in the quieter flow in the lower ground, beyond the limits of exploration, I am afraid the present discovery is of little value. The tinstone at this locality is small and angular, and shows the fine ruby colour characteristic of the purer state of the mineral.