The tin is also of great importance, and should prove of immense value to the Colony, if properly worked, and though many of the claims will, undoubtedly, prove to be of no value, others, there is not the slightest doubt, will be very rich.

THE YILGARN GOLDFIELDS.

Report issued July, 1889.

In this report I do not propose to give a description of all the claims on the field; because I had not time to examine them all, and, moreover, in the majority so little work had been done, that no satisfactory conclusion could be drawn of their possible value. I shall therefore only mention those claims that have been sufficiently opened up, or upon which there is a large enough body of stone in sight, to warrant their owners in putting up machinery at once.

Since my last visit to the Northern portion of these fields, most of the claims, which then extended for miles over the country, have been abandoned, even before they had been thoroughly prospected; and this is just as well, for, as it is, there is still a good deal more land taken up than can be properly developed by the limited capital available in this country, and outside capital will not be invested until some of the reefs have been proved in value and extent: consequently we should devote all our energies to ensure the success of some of the richest areas, and leave the poorer and more difficult until the fields are well established.

Golden Valley.—I start with the Waterhall claim, as it is on the most important reef, as far as at present known, in this part of the field. This area is comparatively small for this district, where thirty-three acres is about the average extent, and it is of an irregular shape as it was taken up at a later date and had to fit in with pre-existent claims. It is in the middle of the valley to the South-East of the Kathleen. The reef was discovered beneath the bed of a little gully and a large *paddock* has been opened on its cap which appears, as far as I can at present judge, to be the top of a saddle reef, one leg of which can be clearly seen to dip to the East, while the other plunges almost vertically down at the West end of the hole, while the country which consists of a compact mica schist on the foot-wall and a hornblende schist on the hanging-wall, has the same anticlinal fold as the reef. This form of reef is characteristic of the Sandhurst district of Victoria, but whether here, as there, both legs will be found to carry gold as they descend, and one saddle below another will be found, can only be proved by sinking; but I am of opinion that this is a true saddle reef, for parallel beds of identically the same rocks occur on the hills to the East and West, with lines of reef of the same description, which may be the legs of a saddle whose cap has been denuded. On the cap of this reef a large body of stone is exposed mixed with fragments of the bed rock. This stone is sometimes white, solid, and granular, but usually it is more like a gossan and contains hematite, iron and copper pyrites, and chlorite, and shows much bright, coarse, free gold in the solid stone; in the gossan and on the faces of the small ferruginous veins some very fine specimens have been obtained, which will make the first crushings very much richer than those that will follow, for this gold is only the alluvial deposit which is generally met with in the caps of auriferous reefs, and does not continue in depth.

A shaft has been sunk, a little to the South of the paddock, to a depth of forty feet; it cut the reef at twenty-four feet, where it was found to be much more settled; it dipped to the East and had a course a little to the West of North, and was about three feet six inches wide. At the bottom of the vertical shaft, thirty-two feet below the surface, a level was driven twenty feet North and South following the course of the lode, and from this another eight feet was sunk. The stone from the

shaft and level is similar in character to that at the surface, but less broken; it shows gold freely.

Although this reef has nothing to speak of in the way of walls, yet from its character at forty feet, and the fact that it extends some way both to the North and to the South, and the character and persistency of the other parallel lodes, I believe this to be a true vein and to offer every prospect of a very profitable mine.

I would advise following this reef down on the under-lay to the water level which will probably be some thirty or forty feet lower, and also extending the level in a Southerly direction to ascertain the extent of the gold-bearing stone.

On the Kathleen claim there are two reefs carrying gold, the one towards the Eastern side of the valley being that first discovered on the field. This reef goes down so vertically that a shaft of 83 feet has continued in it almost all the way down. It has an average thickness of forty-two inches, though at the bottom of the shaft it is only twelve. It is a good deal broken and at one place has been thrown quite out of its course, and so was lost for some time.

Some stone from a depth of thirty feet was sent away for a trial crushing, and gave, I believe, satisfactory results. The gold in the reef is very fine and rarely visible to the naked eye, but will probably pay on crushing.

In the course of constructing a dam on this area, a Northerly extension of the reef that is being worked on the Waterhall claim was discovered in the middle of the valley. A large paddock was then opened up on the cap, exposing a large body of stone, very rich in gold, and a most satisfactory find, proving, as it does, that the Waterhall reef is not a small patch, or shoot, but a large reef, rich in gold, and extending for a considerable distance.

Another shaft is now being sunk higher up the valley and will be carried down to the water-level, in order that the owners may determine if it be good enough to warrant their putting up machinery, though on this question I do not think they need have the slightest hesitation, for the stone now being raised is some of the richest on the field, and has already been proved to be of considerable extent. The stone in this shaft is rather more glassy and ferruginous than that in the other, and contains a good deal of gossan and hematite in places, with here and there a little copper. The whole mass shows gold freely, and in some of the gossan it occurs in small pellets about the size of a pea, which, on being touched, crumble into a fine, gritty, gold powder, while in other parts heavy coarse gold is found. This lode will probably, at the water-level, consist of auriferous copper and iron pyrites, as the gossany hematite cap is derived from the decomposition of those minerals.

Reefs of this description must be carefully worked, for these very rich patches are not likely to be of any very great extent, but by taking the richer with the poorer, and prospecting well ahead, this will, in my opinion, prove a very valuable property.

On the Edith, Marion, and Judith Keaven claims, not sufficient work has, as yet, been done to make it possible to form any opinion of the value of this reef. On the Edith a long tunnel has been started into the hill, but has not yet cut the reef. On the Marion there are two shafts on the same reef, fifty-eight feet apart, one twenty, and the other fifty feet deep. In the latter shaft the reef is two feet wide at the surface, four feet at a depth of thirty-five feet, and then thins almost out, but is beginning to make again at the bottom. The Judith Keaven is as yet untested.

Hope's Hill is situated about thirty miles South of Golden Valley; it consists of a large hill of white quartz of a very unpromising character. Gold was first found at the foot-wall, the East side of this reef, in a white magnesian clay, full of quartz grit. On this side of the reef there is a mass of whitey-brown and greenish-blue banded clay, probably resulting from the decomposition of a

serpentine rock, full of small quartz leaders, of a curious gritty nature. These leaders are, as a rule, rich in gold, and in some parts gold is also met with along the joints of the clay, but for the most part it is not visible, though, on crushing, good prospects are obtained. The bulk of the reef is a white stone of barren appearance, though here and there are bands containing more iron, and which yield, on crushing, very good prospects of gold. The reef, which is about fifty feet wide at the surface, seems to be in reality a series of reefs separated by partings or casings of a white greasy clay. It is now being tested by a cross-cut, and in my opinion the richest stone will be found in the mass of leaders to the East of the reef; and if any gold be found in the main portion, it will be useful for crushing with the mullocky portion. Unfortunately it is a protection area, on which it is only necessary to keep two men at work, so that very little has been done. Two shafts have been sunk, one on the East following down the under-lay, while the other on the West is vertical and is now thirty-seven feet deep, and between these a cross-cut is being put through the entire thickness of the reef. No gold was visible in the stone, but what I crushed gave good prospects, and, although it cannot be foretold how much of the main mass will pay for crushing, I do not in the least doubt but that there is sufficient to ensure a very prosperous mine.

Ridley's claim is the next on the Southern side, lower down than Hope's Hill, but of very similar character. A shaft has been sunk on the foot-wall side of the reef to a depth of sixty feet, and then a cross-cut made of sixteen feet through a mullocky lode full of quartz leaders carrying gold, which, as in Hope's Hill, appear to be the richest portion of the lode. Several cuts have been made on the surface of the outcrop of the reef and good prospects obtained. All these circumstances taken together should encourage the shareholders to thoroughly test this area.

Further to the South, on the same line of reef, is the claim known as the Two Brothers, where a shaft has been sunk for eighty feet; at thirty-five feet a level was driven fifteen feet along the reef, and at the bottom a cross-cut of sixty-three feet to the North-East, and thirty-seven feet to the South-West. In the first of these a mass of banded mullock, full of quartz leaders, many of them ferruginous, all carrying gold, were cut through, while to the South-West the main reef was cut, which here proved to be of solid white quartz, and from which no good prospects were obtained. On the other hand, good prospects can be obtained from any of the leaders passing to the North-East, and in many places *paint* gold is met with on the floors, faces, and through the clay; it is often very fine but sometimes tolerably thick.

Considering the enormous mass of gold-bearing stone, there cannot be the slightest doubt that this property will pay very well, provided that all the fine gold can be secured by any process. A good plan would be to send two tons of the stone just as it is raised, one to be treated by the ordinary crushing plant, and the other by a Huntingdon Mill.

Southern Cross.—Southern Cross is situated about thirty-five miles to the South of Golden Valley. There are here a series of reefs running more or less North and South, and which appear to have been formed at different periods, but without carefully mapping this district, after it has been sufficiently opened out, it is impossible to express a certain opinion on this point; but, for the present, it is enough to say that there are three lines of true lodes, one white, one ferruginous, and one mullocky with quartz leaders, and one series of cross-courses.

These true lodes apparently owe their origin to the great upheaval which has taken place on the Eastern and Western sides of this area, to which they run parallel, while the cross-courses are due to a later intrusion of granite, masses of which stand out as bold, bare, isolated hills.

The country is of comparatively slight elevation, consisting of low thickly timbered hills, flats, and clay-pans, or lakes, the reefs for the most part appearing on the low ridges, but in some cases they are also visible on the edges of the lakes.

The rocks are chiefly hornblende schists, but micaceous, chloritic, and talcose schists also occur, while both to the East and West metamorphic and intrusive granites appear, and occasionally trap dykes are found.

The Central claim has been taken up on a huge reef that can easily be traced from one end of the area to the other, and which shows gold freely in all the pits that have been sunk. The exact width of the reef is as yet unknown, for these surface pits afford no safe criterion for forming an opinion on such a question.

The stone contains many minerals in small quantities, *e.g.*, galena, copper pyrites, iron pyrites (mundic), and chalybite (carb. of iron), and it is well studded with gold, while near the surface many of the specimens are exceedingly showy, owing to a deposit of semi-alluvial gold which has found its way into the cracks and fissures.

On this claim there is a large amount of rich quartz in sight, that only needs to be quarried and carted to the stampers. I would, however, strongly advise the directors not to be in too great a hurry to pay a dividend; but as soon as returns are obtained, to sink a main shaft and open up this reef. As up to the present only a water-shaft has been sunk, the water stands in this at a depth of fifty feet. For although there is so much rich stone at the surface, it is highly probable that at a depth the lode will pinch, and not pay working expenses for a considerable distance, but then lower down will again widen and pay, and such pinchings and widenings may recur several times before a depth of two or three hundred feet has been reached, consequently if a reserve be not kept in hand to tide over the unproductive part of the working, this promising mine might have to be closed.

As the machinery for crushing is now on the field, we shall doubtless within a month or two know the true value of the stone in sight; and I do not think that any but the over-sanguine will be disappointed in the results.

A very rich deposit of alluvial gold has been found in the little gully that runs down from this reef; and it is most probable that when the ground is fully prospected by experienced diggers, many more of these will be discovered.

At the Southern end of the Central claim is the area that has been taken up by Fraser's Company. It has a huge body of rich stone at the surface, more iron-stained and with more gold visible in the faces and joints than in the Central stone, though in the solid stone I did not see as much; but this may be due to the fact that that company was not opening up a rich patch, while the heaps of stone on this claim had probably been well picked over.

This claim has been opened up in a more satisfactory manner than any other on the field, for a shaft has been sunk to the water-level, a depth of forty feet, and then a level has been driven forty-six feet in the body of the reef, and at each end of this cross-cuts have been made to ascertain the entire width of the reef; which in the first of these, that at the bottom of the shaft, is thirty-seven feet from wall to wall, and in the other thirty-three. The whole of this width is not solid quartz, a good deal consisting of a clayey deposit containing ferruginous quartz and hematite leaders, yet the mass is rich enough in gold to pay for crushing.

I believe that it was intended to test this mine to a great depth, but sinking had to be stopped on reaching the water-level, which, owing to the low situation of this claim, is very near the surface.

The machinery will shortly be erected, and as there is a great mass of stone at grass and a good dam full of water no delay will occur in getting a

crushing, and from this mine as well as from the Centrals there is not the slightest doubt but that the returns will be very good.

The Phœnix area, or areas, are situated on one of the black or ferruginous lines of reef running parallel to the Central's and Fraser's on their Western side. I should say that more work has been done on this claim than on any other, but it appears to have been done without any system, and where reefs have been struck in depth they are either barren or too small to be worth working. The best thing now will be to start afresh from where the gold was originally found and follow it down, for in this broken country no rules exist for picking up lost reefs or selecting a place for cutting one in depth.

On another line of reef a little further West is the Exchange claim. The stone is a yellow mullocky mass with quartz leaders carrying gold on the foot-wall side at twenty feet below the surface and down to the bottom of the shaft which is now sixty-eight feet. The whole lode mass is five feet wide and gives good prospects in places, but how much of it will pay for crushing remains to be proved. It will be advisable to run a level at the bottom of the shaft to ascertain how far the gold extends along the course of the lode.

With regard to the other claims I can say nothing, as they have not yet been opened up, which in most cases will be an expensive matter; and if the shareholders are not prepared to meet the cost they had better drop them at once and join in developing those that give a better prospect of an early return, and so attract the attention of the outside world and obtain assistance in working these more complicated claims.

Parker's Find.—Another rich deposit of gold was found about forty miles to the South of Southern Cross, and named after its discoverer, Mr. Parker, who has taken up an area on which there are four auriferous reefs, one being particularly rich. Several holes have been made in the cap, but nothing has yet been done to test these reefs, with the exception of a shaft that is being sunk on an ironstone hill, where some gold was found in a small mullocky "horse" at the surface.

Judging by the richness and extent of the quartz this claim should be tested as quickly as possible, as it will, most likely, prove to be very valuable. There are several other claims on Parker's line, where gold shows freely in the stone, but scarcely any work has been done on them as yet, and in some cases, where the reefs have been cut in depth, they are too small to pay for working. Owing to the great scarcity of water last summer, prospectors had very little chance in this part of the field of developing their claims.

The Uphill's claim is situated on another line of gold-bearing reef, five miles to the South-West of Parker's, and is being tested in a thoroughly systematic and satisfactory manner; first by a vertical shaft of eight feet, then by an under-lay of thirty-eight feet in the reef, and then it is proposed to run a level along the course of the lode to ascertain how far the gold-bearing stone extends. This lode has the best defined walls on the field, is five feet in width, three of which are stone, and the whole is rich in gold. This will probably prove a very rich little mine.

On the Yilgarn claim the reef, having been thrown out by a cross-course, has not yet been struck, although very rich stone has been picked up on the surface.

There are several other claims on this line, but they are not yet sufficiently developed for a report to be made on them. There is said to be another discovery twenty-six miles further to the South, which I consider a misfortune for the present rather than otherwise, for already more land has been taken up than could be worked by the united mining population of Western Australia.

In conclusion, I would repeat that I consider the future of the field depends to a very great extent upon the principal claims I have mentioned being properly

handled at the start. I do not say that they will remain the best things on the field, for it is highly probable that still finer reefs will be discovered when the flats and the lake beds are prospected, and indeed some of the claims that are not now highly estimated may come to the front, whilst others, now so showy, may sink into oblivion.

It is almost certain that large alluvial patches will be found to exist in the deep ground of the lakes, as with so many rich reefs around them it is most improbable that such a deposit as was found below the Central's is a solitary occurrence. Up to the present there have been so few alluvial diggers of experience on the fields that no prospecting worthy of mention has been done in this direction.

Not the slightest doubt exists in my mind of the richness and permanence, and of the ultimate success of these fields, for they have been proved to extend over an area of eighty miles in length; and they will in all probability be found to continue to the South coast. But I consider that it is essential that a railway should be constructed connecting the fields with the settled districts, for no real progress can be made until there is a cheap and rapid mode of transit established, not only for machinery and stores, but also to give visitors an easy access to the mines, for possessors of capital are not likely to undertake the journey by road. I cannot see that the proposed telegraph line will be of any real assistance, while the railway would not only be so, but would form the first section of the great transcontinental line.

The water question has always been, and will always be, a most serious one, but it will, I believe, be from too great an underground supply that the mines will suffer most. Artesian water will never be obtained in the goldfield area, and boring for it is only a waste of money. Large reservoirs should be constructed in the beds of those lakes that are fresh, or nearly so, in which large quantities of water might be stored, and should this become salt towards the end of the season, that remaining could easily be pumped out before the rain commenced.

The water in the mines will, I believe, become fresher after heavy pumping, so that there need be no fear of the future of the field being imperilled on account of the scarcity of water.

EXAMINATION OF THE COUNTRY TO THE NORTH OF PERTH CONTINUED, WITH ESPECIAL REFERENCE TO THE GREAT CARBONIFEROUS FORMATION.

Report issued December, 1889.

As I have twice already in my Reports described the country between Perth and the Irwin River, I do not propose to say any more about it now, although I had again to cross it on my way to the Irwin coal seam.

The Irwin Coalfield.—On revisiting the field I found, that although a good deal of money had been spent in one way and another, very little work of any importance had been done.

Poor shaley seams, similar to those discovered by Messrs. Bell & Elliot which out-cropped in the cliff, on the North branch just outside the Coalfield Reserve, have also been found on the Reserve and for a considerable distance up the branch on which Gregory was supposed to have made his discovery; but up to the present no work of any consequence has been carried on, owing to the immense body of salt water encountered.