

One very marked feature of this district is the poorness of the galenas in silver, which seems so universal in this part that I do not think if this metal is found it will be associated with lead, but with copper or iron gossan, specimens of which I shall test when I get the means. This district I hope to visit again shortly, when I intend to speak more fully about the lodes and formation of the country, but it is very difficult to obtain information about these old mines, or to examine them, as the shafts are not safe and are frequently full of water.

THE IRWIN DISTRICT.—Between Geraldton and the Irwin River, after leaving the flats, there is not much beside sand plains with here and there little gum flats as at Allanooka Swamp and Heelan's Swamp. The river above Yaragadee cuts through these recent rocks, and exposes the large clay beds which underlie the sandstone. These beds are seen all the way up to the coal seam, where there is a change, beds of limestone with fossils, micaceous clays, ferruginous sandstones; and clays with beds of coal dipping at about 20 deg. to the North make their appearance; but what relation these beds bear to those seen further down the river I have yet to work out.

The new discovery of coal is just outside the Government reserve on the North side, and up the Northern branch of the river; it is between two and three feet in thickness and appears to be of very fair quality. It is very easy to work, as one bed is seen running away into the face of the cliff, and being within fifteen miles of the Midland Railway, if it answers for steam purposes, will be very valuable.

On the journey back to Perth I did not examine the country off the road, as I propose to return this way better prepared to do so in detail; but it struck me that quite an erroneous idea seemed to exist with regard to it, and I think that if some prospecting were done a little nearer home it would be crowned with success.

FIFTH REPORT.

Issued in December, 1888.

THE COUNTRY BETWEEN PERTH AND GERALDTON, INCLUDING THE IRWIN COAL SEAM.

On September 28th I left Guildford to examine the country to the North-East, and if possible to tap the line of country between the Yilgarn and Berin goldfields; also to visit Bindoon, Arino, Peterwangy, and the coal seam, to examine and make a collection of the fossils at Gingin, Dandaragan, the Irwin River, and the Horse Hills near Geraldton. I therefore propose dividing this report into two sections; the first on the overland road and the coal seam, the second to be a sketch of the country from Berkshire Valley by Jibeding, Ninghan to Mt. Kenneth, returning by New Gulleway, Gulleway and Peterwangy.

For the first ten miles from Guildford the road follows the rich alluvial flats of the Swan, but after crossing the bridge a section of mottled clay is exposed, in a railway cutting through a low hill, very similar in character to the old river deposits and deep leads of the Eastern colonies. The road from here runs nearly due North following for about fifteen miles the course of Ellen's Brook, which is in reality a series of swampy flats with a low range of clay and limestone hills capped with nodular clay ironstone, and ferruginous sandstone, to the East, which would be very suitable for grape growing, while the flats with their black

sandy soil would grow almost everything in the way of vegetables, to judge from the luxuriant manner in which they grow in the one or two gardens there are.

From the junction of the Bindoon Road to Gingin the country is mostly sand, with here and there a patch of swampy ground where the creeks have washed away the sand exposing the underlying clay.

At Gingin the Mesozoic rocks first make their appearance; they are here, where seen in section, ferruginous sandstone, limestone, and clay; the sandstone beds cap all the high hills, the limestones form fine grassy down-like country, abounding in springs at their juncture with the clay, which formation is rarely seen except in some of the deeper gullies; a large part of the land is very good, particularly along the creek, which is always running. Between Gingin and Bindoon there is a belt of sandy country which extends to within about three miles of Atkinson's, where metamorphic rock, with quartz reef, out-crops. Here gold was found some years ago, and a good deal of money was spent in testing a reef which was not considered sufficiently rich to pay, but it had not been properly tested, and to judge from the rich specimens that have been found at different times and the general appearance of the country, I consider that it is well worth a fresh trial. The rocks about Bindoon are clay-slate and sandstone with quartz and ferruginous reefs, granite and diorite dykes. A large lode mostly of hematite with gossany parts should be tested for gold or silver, as should a dyke of diorite, quartz, and mundic. This belt of mineral country runs a little East of North, and, being softer than the surrounding country, the Chittering Brook has cut a valley in it following pretty much the line of strike; this should make prospecting comparatively easy, as there would be no scarcity of water. Mica has also been found near here, and a large quantity was raised, but it proved to be too much discolored with iron to be of any commercial value; this is due to weathering action, and would not affect it in depth.

At Bindoon Hill there is a large dyke of diorite which has weathered into rounded boulders like those so common in the Northampton district; this is simply due to exfoliation from atmospheric causes, not to the action of water, as is often supposed, as the boulders mostly lie scattered on the cap of the dyke. There is always a rich chocolate soil about these dykes which, if not too stony, produces fine crops. The next 20 miles to the junction with the Newcastle road is mostly covered with clay ironstone gravel and ferruginous sandstone, often containing a great deal of white quartz, but the old rocks, clay-slate, quartzite, and sandstone, with numerous quartz reefs, make their appearance here and there where the streams have removed the more recent beds. This country may be said to extend all across the Victoria Plains as far as Waddington, the only difference being that the flats are larger and more clayey, but it is just about the same line of country as passes through Bindoon, and should, I consider, be prospected with a very fair chance of success.

About 30 miles East of Waddington gold has lately been discovered by Mr. Paine in a small isolated range of hornblende schists, called the Wongan Hills. Several claims have been taken up, and the latest reports and samples appear to be very promising. Copper has also been found in these hills, but has not yet been tested.

For the next 45 miles the road bears more to the West, passing through a more hilly belt of country, where the rock, which is of a highly metamorphic character is better exposed, granites and diorites predominating, though there are fewer indications of minerals. The only two discoveries worth noting in this belt are asbestos near Walebing and a beautiful porphyry near Marah. There are some fine rich flats in the neighborhood of the Moore River and its tributaries, and a very good water supply.

To the Westward this country only extends about ten miles, beyond which there is a chain of salt lakes and flats which drain into the Moore River. They

are interspersed with sandy flats and low hills of ferruginous sandstone, but on getting nearer to Dandaragan the country greatly improves, although there is a good deal of sand in places. From the hills near Lyndhurst Mr. W. Brockman has sent in fossils which proved to be of Mesozoic age, and these beds will probably prove to be a continuation of those seen near Geraldton. The sections seen in the gullies are ferruginous sandstone, clay-stone, clay, soft micaceous sandstone, and clay-stone; this last is of great thickness, as all attempts to sink through it have as yet failed. These beds are probably a continuation of those at Gingin, but here the limestone appears to be entirely absent. This is a very common thing, as these limestone deposits are as a rule very local, and when we recollect that the occurrence of these beds is entirely dependent on the accumulation of a large quantity of coral or shells, it is not surprising.

For the next 40 miles North the country is very uninteresting, sand plains predominating; but after passing Carnamah the road strikes to the North-West through country of a highly mineral character.

Between Carnamah and Arino there is the large valley, in which the Yarra Yarra Lakes are situated, that receives the drainage of all the country East to Lake Monger and North-East to the Greenough and Murchison Rivers. This valley being blocked in by the coast hills, the whole country is flooded whenever there is a heavy rainfall Eastward, though in ordinary seasons the Yarra Yarra Lakes are rarely filled.

Between the Lakes and Yandenooka there is a fine belt of mineral country. Copper stains are of common occurrence, and several good lodes have been discovered and worked, but the very great expense of carting the ore to Dongara—over about 50 miles of sandy plain—has stopped their progress. The samples I have seen from this district are mostly green carbonates, and one mass that Mr. Criddle has at Dongara must weigh over a cwt., and would, I believe, assay about 60 per cent. These lodes are decidedly worth a trial, now that copper stands at so high a price. Lead will also probably be found, as this district is very similar to Northampton, and, as there is coal close by, it might be smelted on the spot. All samples from lead, copper, or iron lodes should be tested for silver.

The springs form the great feature of this belt of country; they are generally found on the tops of small travertine limestone hills, all of which have been formed by them; but what is most remarkable is that the water in the springs on one hill varies a good deal in quality. These springs rise from the Carboniferous rocks, which here rest against the low range of crystalline rocks to the Westward, thus forming a basin between it and the Herschel Range.

The country between Yandenooka and the Irwin is all sand except along the course of that river, where there are beautiful alluvial flats; these also extend up to where the river enters the gorge to the South-West of the coal seam.

Just outside the coal field reserve, on the North branch of the Irwin River, Mr. Bell has discovered some fresh seams of coal. On my first visit I thought this, from its appearance, to be lignite, but I find, on examining the fossils from the overlying limestone, that this is incorrect, for they are true coal measure fossils.

These seams are well seen in the cliff section cut by the river, which flows (when there have been heavy local rains) between almost vertical banks of from 200 to 300 feet in height, reminding one of the cañons of the Colorado on a small scale. There are seven seams, varying in thickness from 3 to 8 feet, interspersed with beds of micaceous clay, limestone, and sand, dipping at a slight angle to the North-East. A drive of fifty feet has been put into the face of the cliff on the uppermost seam, which was found to improve greatly in this short distance both in size and quality; this drive I advised them to carry on another 50 feet to get a really fair sample, but at present the men are engaged in testing the lower seam, which is far better looking at the surface than the first seam worked. The

simplicity of working these seams, and their number and size, should make this a very valuable property in the future, when there are more uses for coal in this Colony; but nothing can be done with it till it is connected with a port by railway, as the cartage would make it a very expensive luxury.

A seam has also been discovered by Mr. Whitfield on the South branch of the Irwin, not far from Yandenooka, but I did not see this when I was in the district. The lowest bed of the coal measure series in this district is clay-stone of great thickness; which rather leads me to conclude that the clay beds met with at Dandaragan and Gingin, underlying the Mesozoic, are a continuation of the same bed; should this be the case we cannot tell where coal may next crop up down the coast. The clay beds are overlaid by limestone, micaceous clays (which may prove to be fire-clay), sand, sandstone, coal seams, and shale; there is a great series of all these beds, with the exception of the clay-stone. The whole of these are overlaid unconformably by a ferruginous sandstone and conglomerate of recent age, very similar to what is forming in the river bed at the present day; they are probably a portion of the desert sandstone series of the interior, which as far as I can determine are of terrestrial origin.

The area on which coal may be discovered embraces all the upper branches of the Irwin River, from Yandenooka Northward to the Greenough, as this formation probably underlies the sand plain table-land between these two rivers, though this as yet remains to be proved.

It will be seen from the above that there is a fairly good mineral-bearing country all along the North road, and that mining is simply at a standstill, not for want of material of good quality, but on account of the expense of carting; and if the Midland only goes ahead we shall have a number of flourishing mines along it in a very short time: also, as the railway will pass within fifteen miles of the coal seam, there would be a branch line run to it, if the company did not find the coal on their own land on the South branch to be of any value.

SKETCH OF THE COUNTRY PASSED OVER ON A TRIP NORTH-EAST FROM BERKSHIRE VALLEY TO MT. KENNETH, RETURNING BY PETERWANGY.—From Berkshire Valley to Edawa, a distance of 16 miles, the country is mostly granite with patches of alluvium and sand, but destitute of any mineral veins. After leaving Edawa there are first 11 miles of very heavy sand, and then small rocks and yellow clayey flats for 5 miles to a rock-hole in a mass of graphic granite. From there to Jibeding, 29 miles, are alternate patches of granite, clay, and sand.

Jibeding is on the edge of a large salt lake, probably part of Lake Moore, as similar flooded salt country (with here and there a protruding mass of granite) extends to the Ninghan Range. This range is a lofty group of hills rising between Lakes Moore and Monger, and attaining its greatest elevation (about 4,000 feet above sea level), in a big mass of dolomite sandstone, called Mt. Singleton, or Ninghan. The rocks in the rest of the range are slate, quartzite, hornblende rock, granite, and amygdaloid, with ferruginous jaspery quartz veins and hematite lodes, which latter should, I think, be tested for copper and silver.

There are several isolated ranges to the North, North-East, and North-West beyond the Lake; which would, in all probability, be also worth prospecting.

Between Ninghan and Mt. Kenneth there is very little of interest from a miner's point of view, as it is mostly flooded ground, with a little granite here and there. There is a ridge of desert sandstone on the West side of Lake Moore at Goodenow.

Near Mt. Kenneth there is an entire change of country, flat-topped hills, quartz reefs, ironstone lodes, and large alluvial flats. This country is of a very

promising character for gold, and I should like to have spent some time examining it, but was prevented, as the water was so salt that it made the horses ill.

Mt. Kenneth is a very big flat-topped hill, which can be seen a good distance, as the country rises towards its base for about ten miles; it is nothing but a steep cliff about 100ft. high, the top of which rather overhangs, making it very difficult to climb. The lower part is of a ferruginous quartzite, dipping at a high angle to the East, whilst the top is horizontally bedded desert sandstone. The rocks of the lower ridges and outcrops in the flats are clay-slates, quartzite, mica schist, sandstone, and granite, with many quartz reefs. Gold will in all probability be found here, and water should be easily obtained in the large flats at no very great depth, and as Mr. Morrissey informed me that there are a great many natives in the bush about here, there must be an abundance of surface water, or springs, as yet unknown to the settlers. From a grazing point of view, I have never seen better country for both salt-bush and grass; and it seems strange that so little of it should be stocked, situated as it is only two hundred and fifty miles from Dongara.

Further North this country extends about sixteen miles, after which we get sandy plains and bold granite hills up to Mr. Broad's station, which is situated on the side of a small quartzite range running North and South, in which there are some reefs, but not of a very promising character. After crossing the range there are clay flats and masses of granite, to Mr. Oliver's station, and this class of country extends to Jarraminda water-hole. From this the road follows up a small salt creek, with water-holes, for thirty miles in a North-Westerly direction, with granite in the bed of the creek and desert sandstone cappings on the high ground. The latter forms a large scrubby table-land as far as the eye can see to the North-East and North; it is bounded on the West by the Northern extension of the Minjar Range, which is crossed by the road a few miles from Badgera, where the rocks are clay-slate and quartzite on the East side and granite on the West. In this range there are some very rich-looking quartz reefs, which I think should be prospected.

The next thirty miles of country Westward is flooded ground, with lakes here and there and masses of granite rising to the surface, but forming no hills till you come to Gulleway springs, which are situated amongst some bold granite hills rising out of alluvial flats. This class of country extends North towards the Murchison, and West to Peterwangy, with here and there some small outcrops of slate, with quartz reefs and ridges of desert sandstone.

Peterwangy is situated on the line of escarpment of the old crystalline rocks, which extends from the South to here, and probably once formed the coast line. Gold was found here some years ago in small quantities, but never paid to work. The rock is granite with some quartz, and overlaid in many places by clays, which are probably old alluvial deposits; and it is, I believe (judging from the waterworn character of the gold) from these deposits that the gold has been derived, as the rocks and reefs about the diggings are not at all promising in appearance. Granites themselves sometimes contain a small quantity of gold, and this may be the case here; but if the gold about here has come from reefs at all, I should think that it came from the country which is further up the Irwin, where are some very good looking reefs.

As a whole—this country is not very interesting, though round about Mt. Kenneth I think gold is certain to be found. Mt. Singleton Range, and the Minjar Range should also be prospected.
