

WORK DONE IN 1889.

Immediately after the completion of my Annual General Report for 1888, I proceeded to Newcastle, Goomalling, and Wyening, to inquire into some reported discoveries of coal.

My second trip was to the country South of Perth, visiting Bunbury, the Vasse, the Fly Brook coal seam, and the Warren; then returning to the Vasse, and Bunbury, on to Bridgetown, and the Tinfields, overland to Albany, Eastward to the Fitzgerald and Phillips Rivers, to report on the supposed coal seams, then back to Albany, and by rail to Perth.

I was next employed in reporting on the prospect of Artesian water being obtained by the Government on the Eastern Goldfields, and in this trip I included Golden Valley, Southern Cross, and Parker's Range.

I then went to the North to continue the work of the previous year, travelling *via* Newcastle, the Irwin coal seam, then across the Mullewah and the Greenough River, to Northampton, the Geraldine, up the Murchison River to Milly Milly, across to Mount Claire on the Gascoyne, and down this river to Carnarvon.

During this year I have travelled about 4,000 miles on service, mostly by road, and have mapped about 64,000 square miles of country.

THE COUNTRY BETWEEN PERTH AND BUNBURY, VASSE, AND FLY BROOK.

Report issued June, 1889.

On the 12th March, 1889, I left Perth for the South by the main Southern road, along which, between the Swan and the Canning Rivers, are sandy and swampy flats similar to those between Guildford and Fremantle, the sand being probably derived from the weathering of the soft sandstone of Tertiary age, which are exposed along the coast in places, and in the banks of the Swan and Canning, forming high cliffs where the rivers have cut through them.

These sands often contain a large percentage of clay, lime, and iron, and in some places are so clayey as to be quite impervious to water, and then swamps are formed, which are often covered by a rich peaty soil that if drained and cultivated, as in the Chinamen's gardens in Perth, will grow almost anything; though even the sands themselves, as in Mr. Moore's garden, near Fremantle, are wonderfully adapted for the growth of fruit trees and grape vines—in fact, all this land, now only covered by thick, useless scrub, will, before very long, I feel confident, be one magnificent garden.

After crossing the Canning bridge, the road passes along the alluvial plain on the Western bank as far as the town-site of Kelmscott, where the river turns to the East passing into a deep gorge in the range, while the road, crossing over the foot of a spur of the range extending Westward, leads on to Narrogin.

On the Canning, some years ago, a bore was put down about 170 feet to test for coal, but the record of what was actually passed through seems to be lost,

except that some beds of a carbonaceous clay were met with just before the rods broke, and the work was abandoned. There are many quartz reefs and dykes near the foot of the ranges; in the *débris* of these, in the river bed, several minerals were found by Mr. Gregory, proving that lodes do exist in this locality, which should encourage prospectors to examine the district, and they would be much assisted by the fine section cut up by the river through the range, where both the lodes cut and the detritus derived from them might be easily examined. It is needless to add that any mineral discovery in this district would be of the greatest value on account of its nearness to a port and the capital, so that the expense of cartage would be slight, and the mining could be easily and cheaply done.

The rocks at the foot of the range are slate, sandstone, and quartzite, capped with ironstone gravel, sand, and ferruginous sandstones, with rich patches of alluvial soil in the gullies, as at Narrogin, on which orange and other fruit trees seem to thrive wonderfully.

Similar country extends to within a few miles of Pinjarrah, the only other rock exposed being at the Government Well on the Serpentine River, where we find a coarse, white, quartz grit; but what relation this bed bears to either the crystalline or the more recent rocks it is impossible to say, as the whole surface is covered with ironstone gravel and alluvial deposits.

At Cardup and Jarrahdale some lead lodes were opened some years ago, but were found to be too small to work, although the lead carried a fair percentage of silver.

A few miles North of Pinjarrah the country opens out into the fine alluvial plains of the Murray River, on which there is some very fine land, though most of it towards the coast is covered with sand, which extends down towards Peel's Inlet.

In the ranges to the East of Pinjarrah, tin and silver were supposed to exist, but, unfortunately, the silver proved to be white mundie (marcasite), and the tin to be oxide of iron; but, from the general appearance of the rocks, which are granite, mica schist, quartzite with felstone dykes, and numerous nice looking quartz reefs, which run North and South, dipping sometimes East and sometimes West, I should advise the prospectors not to give up, but to confine their attention more to prospecting the gullies, leaving expensive sinking in rock until they have been able to trace fragments of mineral to the vicinity of some lode, or have found it in the stone itself.

Between Pinjarrah and Bunbury, for the first ten miles, the road follows the alluvial plain on the West bank of the Murray River, until it turns to the East and cuts into the range. From this point the road runs in a Southerly direction on the plains at the foot of the hills over sandy and alluvial flats and low spurs capped with ironstone. After crossing the Collie River the road turns West towards the coast, leaving the range and crossing the alluvial flats towards Bunbury.

In the neighborhood of this town there is some of the finest land in the Colony, which, owing to the fine climate and good rainfall, will grow almost any crop, but for some reason very little of the land that was formerly cultivated is now worked, and I was greatly surprised to see a cargo of wheat landed in a district that could grow enough to supply the whole of Western Australia.

At Bunbury a dyke of columnar basalt out-crops on the beach, appearing to run in a Southerly direction towards Black Point, on the South coast, as it makes its appearance here and there between these two places.

A few miles from Bunbury, on the Preston River, are some old workings, where two or three pits have been sunk down to the water level, with the idea of prospecting for coal, as some carbonaceous matter had been found in the bank of

the river associated with sandstone and clay. These pits have now fallen in, and the *débris* from the cliff has quite covered any exposure there might have been in the river bank, so I was unable to see anything; but it is highly probable that a modern coal or lignite may be met with here, and I should very much like to see a bore put down. I think that in cases like this the Government should allow a person or company to test land without taking up an area, then give the first chance of selecting a claim to the fortunate discoverer of any valuable mineral.

Between Bunbury and the Vasse the country is for the most part sandy, with here and there clayey swamps and fine alluvial flats along the streams.

About three miles from the Vasse there is an outcrop of a very compact, grey dolomite limestone, the age of which is uncertain, as no fossils have been met with in the stone, which has only been taken from the small excavations near the lime kilns, but from its crystalline appearance I should judge it to be a good deal older than the earthy white Tertiary limestone of the coast.

From the Vasse the first ten miles to the South-East are mostly sandy and swampy, but then the road ascends into the spurs of the range, which are covered with ironstone and ferruginous sandstone, as far as St. John's Brook, where the crystalline rocks are exposed, and continue to out-crop to the Lower Blackwood Bridge. Between this and Mr. Brockman's, on the Warren River, the country is mostly hilly, the ridges being capped with ferruginous sandstone and patches of waterworn boulders, while in the gullies, granite, quartzites, etc., make their appearance. The land here is very good, but so heavily timbered that it would almost take a fortune to clear it, though between this range and a small coast range that runs from Cape Naturaliste to Augusta there is a large belt of swamp land, highly suitable for the production of root crops, and, as Mr. Dickson informed me that he got three crops of potatoes out of the same land in one season, one naturally comes to the conclusion that this land ought to pay well to work.

The Fly Brook is the furthest branch to the South-East of the Donnelly River, which discharges itself into the Southern Ocean about thirty miles East of Cape Leeuwin. It is always running as there is as large a rainfall here as in any other part of Australia, but, unfortunately, it is not navigable, the good-sized estuary at its mouth being closed in by a sand-bar; the nearest ports that ships can use being Augusta and Hamlin Harbor, which are about 30 miles to the West.

On this Brook some coal mining leases were taken up last year, but the existence of these seams appears to have been known for many years to some of the older inhabitants. Several reports had been made on it, and in most of these the opinion was expressed that it was only a charred log, which fortunately proved to be incorrect, as we now know that four seams of a good lignite out-crop in the gully. These are, at present, being tested in a systematic manner by Mr. Richard Baxter, who is putting down a series of bores to determine the number, size, quality, and extent of the seams, which he has already shown extend over the whole area taken up, the large seams being easily identified when met with in the different bores by their persistent thickness, associated beds and partings, but, up to the present, he was unable to test the entire thickness of this formation in the deep ground, as there was so much water that the bore hole was continually falling in. This difficulty he will now be able to overcome by means of tubing, and is working with the intention of boring till he comes to the bed rock. In one of the bores (sections of which both Mr. Baxter and Mr. Ross have been kind enough to send me), we find that they have passed through about 20ft. of lignite in sinking to a depth of 128ft. This consists of seventeen seams, the largest of which were 5ft. 4in. with a 6in. clay parting, 2ft. 4in. with a 3in. parting, and 2ft. 3in. with a 2in. parting. Several other seams, up to a

foot in thickness, could also be worked, as several occur close together with shaley partings.

The lignite itself is a highly lustrous variety, having almost the appearance of jet, but lacking its hardness, while the woody structure is clearly visible in some pieces, and on assaying it proved to be almost identical in composition with the cretaceous coals of the Pacific coast of North America.

The average of three samples of Fly Brook coal, assayed in Melbourne and Adelaide, and three samples of American is:—

		Fly Brook.	America.	N.S. Wales.
Water	...	16.40	14.00	2.22
Volatile matter	...	38.23	38.17	29.94
Fixed Carbon	...	43.52	44.14	58.99
Ash	...	1.85	3.69	8.85

I have also added an average of 94 samples of coal from New South Wales for comparison, and it will be seen at once that the two great points of difference are the quantity of water and fixed carbon, and, although the Fly Brook contains so much volatile matter, chiefly hydro-carbons, it cannot be profitably employed for gas manufacture, as it is non-caking; that is to say, the coke it forms is in a state of powder and so of no commercial value—and gas companies rely on the sale of coke for a large proportion of their profits, but, as the similar coal in America is used largely for steam and other purposes, there is no reason why this should not turn out to be of great value to its owners and the Colony generally, the great drawback being the distance from a port, and the large percentage of water it contains, which renders it too friable for much handling. It is sure to be said that the samples sent away were no test, as they came out of the creek bed, but this will not make the slightest difference, as the superfluous water would have had plenty of time to evaporate before it reached the assayers' hands, and the lignite from a depth will be found to contain quite as much, for all lignites or recent coals are distinguished by their high percentage of water.

The exact age of this lignite I was unable to determine, but, from its character and the general appearance of the country, I should certainly consider it to be Mesozoic; still, considering its position and the number and size of the seams, it is, as I have before stated, a very valuable discovery.

The coal-bearing series here consist of sandstone grits and clay beds (the latter of which are often micaceous), the whole being overlaid by a bed of ferruginous conglomerate, containing large waterworn pebbles of quartzite, quartz, and other crystalline rocks. This bed is met with in many places in this district, and probably forms the junction between the series and the more recent clays, sands, and ironstone which cover most of the surface. From what I have seen, and gathered from Mr. Baxter, who has examined most of this district, I have come to the conclusion that this formation will be found to extend over a considerable area, at first in a North-Westerly and then in a Northerly direction, towards the Vasse, where some samples of a less highly mineralised form of lignite have lately been found in sinking a well. This can only be ascertained by boring, as, with the exception of the Blackwood valley, most of the surface of this belt of country is covered with sandy or swampy ground. A few bores put down to the bed rock would be of great interest, as we should then know for certain if true coal measures exist beneath these more modern deposits.