

ON THE DEVELOPMENT IN MINING IN THE LOCALITY OF DONNYBROOK.

In the previous Annual Report, a short *résumé* of the geological features of the vicinity of the Donnybrook Mines, in so far as they could then be seen, was given. The country rocks consist of massive hornblende and gneissic granites, intersected by a narrow belt of hornblende rock, passing in a North and South direction throughout the length of the goldfield. Overlying the greater portion of these rocks are recent superficial deposits of ironstone gravels, sands, etc. The quartz reefs occur in the granite. Since furnishing the previous report, recent developments have proved the existence of extensive sandstone deposits which underlie the ironstone gravels. These sandstones, which are usually of a light grey colour, are fine grained and of an even texture. They are usually soft, though often they become sufficiently compact to be serviceable as building stone. Examined under the microscope, the component grains of quartz are seen to be extremely angular. So far as could be seen, the maximum thickness attained by these sandstones is not less than 150 feet. For some considerable time past, the prospectors affirmed that by washing the *débris* on the sides of the sandstone hills "prospects" of gold could be obtained, but the general belief was that the gold came from the overlying ironstone gravel deposits. Recent developments have proved that payable quartz reefs occur in the sandstones as well as in the unaltered granites, and thereby considerably increase the probable resources of the field. That the sandstone contains payable lode stuff I consider an important factor in determining the future of the field, inasmuch as the sandstone having been much denuded is, in all probability, the source of the rich alluvial deposits. The sedimentary rocks consist of alternating bands of fine sandstone, shales or mudstones, brown coal seams, and conglomerates. The Eastern boundary of these deposits is formed by the main watercourse which runs North to the Donnybrook townsite and empties itself into the Capel River. The following is a detailed account of the principal workings in the sedimentary rocks, starting from the Southern end of the field.

YOUNG'S PROSPECTING AREA (ABANDONED).

A prospecting shaft has been sunk to a vertical depth of about 94 to 95 feet. I was unable to descend the shaft, but believe the following section, as given to me, to be correct :—

Nature of Strata.	Thickness of Strata in feet.	Depth beneath surface in feet.
Sandstone beds ... ..	60	...
Bands of brown coal in dark shales ... ..	5	60
Turpine brown coal with thin seams of brown coal (the whole is flammable)	2	65
Sandstone more or less ferruginous ... ..	28	67
Total ... ..	95	95

WELLINGTON G.M.L. 28.

One shaft has been sunk on this lease to a depth of 94 feet 6 inches. The following is a section as seen in the shaft :—

Nature of Strata.	Thickness of Strata in feet.	Depth beneath surface in feet.
	ft. in.	ft. in.
Sandstones with rounded boulders ... ..	50 0	0 0
Shales with patches of lignite ... ..	6 0	50 0
Sandstones with rounded boulders ... ..	1 0	56 0
Shale bands in sandstone ... ..	37 0	57 0
Thin seam of pyrites ... ..	0 6	94 0
Total ... ..	94 6	94 6

THE SKIPPER G.M.L. 7 (HISLOP'S SHAFT).

The section shown in the main shaft which has been sunk to a vertical depth of 104 feet is as follows :—

Nature of Strata.	Thickness of Strata in feet.	Depth beneath surface in feet.
Sandstones ... ..	80	...
Mudstone ... ..	7	80
Sandstone impregnated with iron ... ..	17	87
Total ... ..	104	104

In addition to these shafts several others have been sunk (to the West of the Creek) to a depth exceeding 100 feet, and in all cases sedimentary deposits have been pierced.

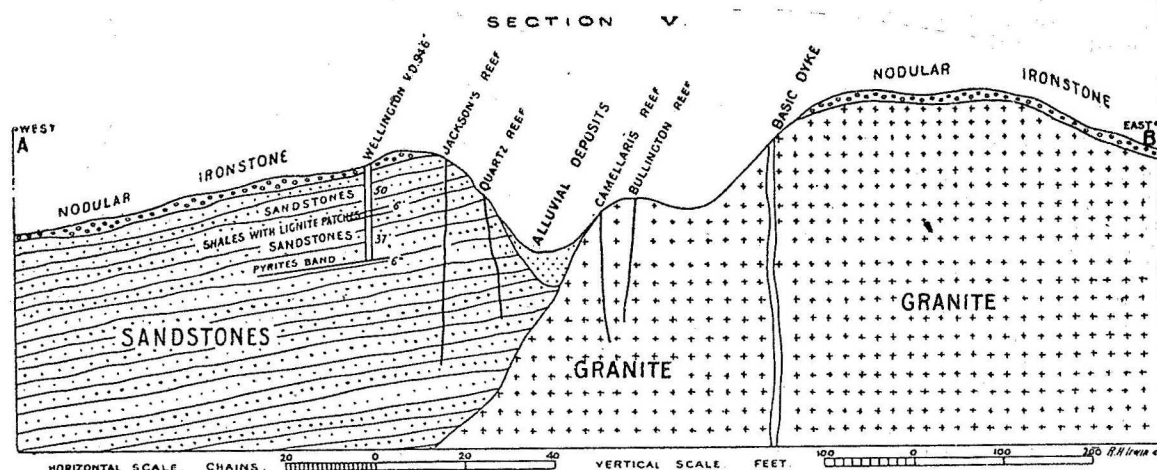
The strike of the sandstone beds is approximately North and South, with a dip to the West of from one in eight to one in ten.

In one case only has a payable ore body been met with occurring in the sandstones, viz., Jackson's Reef, a full description of which has been given in a previous report. Other quartz bodies of low grade however exist. From this reef 10½ tons 19cwt. of quartz have been treated up to the end of 1899 for a return of 299ozs. 2dwts. of gold, or at the rate of 2ozs. 17grs. per ton.

Prospects of gold are to be found on the surface of much of the sandstone country. These prospects arise most probably from the concentration of the gold set free from the disintegration of the quartz bodies both of the sandstones and granite. There is no available evidence as to what is the total thickness of the sandstone beds or the nature of the lower strata of the series. The great influx of water (below the water level) will prevent alluvial miners from solving this question, and it is doubtful whether the leaseholder will pursue prospecting to much greater depths as the pumping even to the 200ft. level is becoming an expensive matter.

In the recent alluvial beds, which lie in the basins of the creeks, there is every prospect of payable alluvial ground being discovered, but here too the alluvial miner has been forced to abandon his repeated efforts to bottom, by the enormous influx of water.

Owing to my inability to take a series of levels, from not having any suitable instruments with me, the accompanying section No. 5 is approximate only, and can, therefore, under the circumstances, be considered as a rough sketch.



SKETCH SECTION ACROSS DONNYBROOK GOLDFIELD LINE A to B.

#### THE MINING DEVELOPMENTS OF THE FIELD.

Unfortunately, owing to the late heavy rains, many of the mines were flooded with water, and consequently the workings were hidden from view. These conditions obtained more particularly in the mines I inspected on my former visit, which embrace most of the properties situated in the granite country. As the sandstones and gravels were much less saturated with water I was able to inspect most of the workings in these deposits. The following are brief descriptions of them:—

#### QUEEN OF THE SOUTH G.M.L. 5.

*Jackson's Claim (Blocks 5 and 13).*\*—On Block 5 one shaft has been sunk to a vertical depth of 70 feet and drives opened out at the 60 and 70ft. levels. In addition a crosscut extends to the East at the 18ft. level for a distance of about 70 feet, and connects with an old prospecting shaft.

*Fifty Feet Level.*—At the 50ft. level drives extend North-North-East and South-South-West along the lode for distances of 20 feet each way. The lode, which consists of granular quartz mixed with a small percentage of kaolin, has a thickness varying from 15 inches to two feet. The walls of these drives consist of compact grey or red sandstones, which in places are intersected by small veins of lode material.

*Seventy Feet Level.*—Driving at this level has been carried on only towards the South, and that for a distance of 35 feet. A distinct change both in the lode and walls of the drive is seen at this level—the walls instead of being soft and friable as in the 50ft. level, consist of a much harder material, the sandstone being in places quasi-vitreous. Similar hardening has taken place in the lode, the greater portion of which, in the face of the drive, is almost pure compact quartz with a small vein of granular quartz to the Western wall. Thin bands of steatite (hydrated magnesian silicate) are found between the

\* Vide accompanying map, Plate V.

lode and the Eastern wall. The lode at this level varies in thickness from 15 inches to as much as three feet. The strike of the lode is approximately North 10 degrees East, and is practically vertical, though at different levels it underlies very slightly either to the East or West.

On Block 13 another vertical shaft has been sunk slightly to the West of the strike of the lode occurring in Block 5—the vertical depth of this shaft is 80 feet. The country rock is sandstone. The mode of occurrence of the gold in the lode is worthy of notice as it assumes usually a peculiar arborescent form. Gold is visible in a free state in much of the lode stuff. At the date of my visit fifty tons of ore taken from the lower level were bagged and ready for transport to a local battery. The output of the mine to date is 104 tons 19cwt., which yielded 299ozs. 2dwts. of gold, or at the rate of 2ozs. 17dwts. per ton.

#### G.M.L. 17.

The workings on this lease consist of several small prospecting shafts and costeens, situated along the outcrop of a quartz reef, which has a strike slightly to the West of North. All these workings are at present full of water. There is sufficient evidence, however, to show that a well-defined reef extends through the centre of the property. Work has been suspended for a time. The country rock is granite.

#### LAYMAN AND PARTY (G.M.L. 15).

The workings on this lease consist of one main shaft which has been sunk to a vertical depth of 85 feet. Owing to the rain and heavy soakage further operations had for a time to be abandoned. At a depth of 20 feet from the surface a reef, most probably the Northern portion of the reef passing through Hunter's and Bourke's claims, was cut in the shaft, and was not passed through till the 50ft. level was reached. This body of quartz is the full width of the shaft, but as its underlie is still unknown its true thickness cannot be calculated at present. A smaller quartz body, I have reason to believe, was partially opened out at the bottom of the shaft.

#### THE WESTRALIA (G.M.L. 3A).

Three shafts have been sunk on this lease. One situated in the North-Eastern corner of the property has been sunk to a vertical depth of 60 feet, but has since been partially filled with water. In the South-Eastern corner of the property are two shafts, each with a vertical depth of 30 feet. Crosscuts East and West connect these two shafts at the 30ft. level, and extend 50 feet further to the West. The country rock, which is a highly decomposed granite of which the component parts, quartz in particular, have been cemented together, contains numerous quartz leaders; but so far no defined quartz body has been discovered in the present workings. Work was being carried on at the date of my visit.

#### Rigg's P.As. 17, 18, and 19.

Prospecting has just been started on these blocks on account of good alluvial prospects having been obtained in the gullies to the East. Though no well-defined ore could be seen in the bottom of one prospecting shaft at a vertical depth of nine feet from the surface samples taken from this quartz yielded small returns of free gold. The country rock hereabouts is sandstone of various colours and degrees of hardness, overlain with several feet of fine-grained sand.

#### BOURKE AND WILLIAMS' CLAIM (Block 310).

The main shaft has been sunk to a vertical depth of 60 feet to the West of a line of reef running North and South through the centre of the property. Though the quartz reef does not make any pronounced outcrop at the surface, floaters of quartz indicated the presence of a reef, which was found at a depth of a few feet beneath the surface. The shaft passed through ironstone gravels and sandstone at first but only near the surface, for at no great depth these deposits were pierced, and in the bottom of the shaft the rock consists of a much kaolinised rock impregnated with iron. The quartz is charged with pyrites and contains traces of gold. Near the surface the thickness of the reef averages about 2 feet 6 inches. Nodules of iron pyrites occur on the footwall of the lode. To the East of the main lode a small quartz leader underlies at an angle of some 45 degrees to the West; this leader contains free gold, visible to the unaided eye. What appears to be a vertical ironstone lode has been partly opened up to the North of the main quartz reef, but sufficient prospecting has not been done to prove whether this may or may not be an exceptionally ferruginous portion of the gravels previously alluded to. In any case it is interesting to note that the deposit, whatever may be its nature, is auriferous, for specimens taken from the outcrop of this ironstone body yielded fair prospects of free gold when crushed and washed by hand.

#### COULSON'S CLAIM (G.M.L. 48 P.P.).

Coulson's Claim, which lies to the South-East of Bourke & Williams' (Block 310), contains what is supposed to be a continuation of the lode passing through Rigg's Claim (Block 18). Such may prove to be the case, but as the intervening country is covered with ironstone gravel or sand, the existence of a continuous lode is purely supposition at present. The strike of the lode in Coulson's Claim is North 5 degrees West. One shaft is being sunk, and has reached a vertical depth of 10 feet. The gold is found in two distinctly different lode materials; one consists of a pyrites quartz reef, which carries a trace of gold only, the other is a highly silicious ore body, which gives fair prospects of free gold when

dollied and washed off in a prospector's dish. A specimen of the pyritous quartz body yielded at the hands of Mr. Simpson, in the Official Laboratory, a trace of gold to the ton, while a specimen of the lode material assayed 1oz. 3dwts. 9grs. of gold per ton.

#### H. B. JOSEPH'S (BLOCK 53).

A quartz body at least three feet in thickness strikes North 20 degrees West through this property. The underlie is to the West. Several small prospecting shafts and costeens had been put down to prospect the lode, but these workings were filled with water. The country rock is granite.

#### MILL'S CLAIM (G.M.L. 4).

One shaft, with a vertical depth of 40 feet, has been sunk on Bourke's (Bullington) line of reef, and I am told that the reef has been cut in the shaft and proved to be five feet in thickness. The shaft is partially filled with water. No crushings of the lode have been taken out up to date. The country rock is granite. A cross reef striking North-East and South-West intersects the main line of reef a few paces to the South of the shaft. This cross reef, I am credibly informed, does not yield prospects of free gold.

#### THE PROSPECTS OF THE FIELD.

From the appended returns of the Donnybrook Field it will be seen that eight claims have produced payable ore, and that the total output, excluding alluvial, has been 312 tons 14cwt. of ore treated for a return of 496ozs. 10dwts. 6grs., or at the rate of 1oz. 12dwts. 2grs. per ton by battery amalgamation. The ore bodies from which this gold has been obtained are up to the present quartz reefs, traversing the granite as a general rule. From the evidence revealed in the developments up to the present, there is every reason to believe that these reefs are true fissure veins, and though the persistence of the reefs has not been tested to greater depths than 80 feet, there is however no change in their habit such as would lead one to suppose they will not continue to much greater depths. In the case of Jackson's claim, where the lode has been followed in sandstone to a depth of 70 feet, and where the lode and country rock have changed, the change is favourable, as the walls become more regular and the lode widens out considerably. With two exceptions the lines of reef have not as yet been traced for any great distance, and exploited much less, but as the country is much overlain with superficial deposits this is only what could reasonably be expected. There are, in addition, numerous quartz bodies in the vicinity of the present workings, and extending for considerable distances towards the South, which have as yet received no attention whatever. Taking the developments as they stand at present, there is sufficient ore in sight to yield fair returns even at a much lower average than that which has already been maintained, and this for an extended period. In addition, the appended alluvial returns distinctly show that payable quantities of gold lie in some of the heaps of broken *débris*. That such surface gold must have been more or less concentrated in the watercourses and alluvial flats is more than probable, and must in due time receive attention, when the water can be coped with by adequate machinery.

Two milling plants are on the field at present—one a Tremain 2-head battery, the other an ordinary single cradle ball mill.

Before concluding I wish to draw your attention to an obvious misrepresentation of my last report on the Donnybrook district in the local Press.\* Referring to the reefs occurring some miles to the South of the proposed goldfield boundary my report reads as follows:—

Prospectors have tried these (the reefs) in a haphazard style, and as pyrites was visible in the surface stone they apparently gave up the search.

A foot note gave the assay value of the reefs in this locality to be 3dwts. 6grs. of gold per ton.

In concluding the report, and dealing with the extent of the auriferous belt, it was stated that—

Similar country, however, extends in a North and South direction for a considerable distance beyond the present workings, and, as it contains unprospected quartz reefs, there is a probability of fresh developments taking place in the near future along this line.

No further reference was made in my report to this portion of the field. The concluding paragraphs of the *West Australian* convey a very different meaning. They read as follows:—

Similar country, however, extends in a North and South direction for a considerable distance beyond the present workings, and as it contains unprospected quartz reefs, there is a probability of fresh developments taking place in the near future along this line. No prospecting to my knowledge has been carried on outside the proposed boundary and in the vicinity of the same. The following is the result of the assay of a sample of the whole, taken by me from one of the quartz reefs occurring on the Southern portion of the proposed Donnybrook Goldfield—3dwts. 6grs. per ton.

In justice to myself I consider it necessary to draw your attention to the entire misrepresentation of my impressions of the district, which is conveyed by the last quoted paragraph, which has since been further distorted into the statement that 3dwts. 6grs. was the average value of all the ore deposits in the field.

\* Vide *West Australian*, 7th January, 1899.

The following table gives the returns from the district up to the date of my visit :—

Number of Lease.	Name of Lease.	Date.	Quantity of Stone Crushed.	YIELD OF GOLD.	
				Total Yield.	Rate per Ton.
10	Bullington ... ..	1898	tons cwt. qrs. 8 0 0	ozs. dwts. grs. 5 3 0	ozs. dwts. grs. 0 12 21
		1899	26 0 0	6 10 0	0 5 0
	Total ... ..	...	34 0 0	11 13 0	0 7 0
pp. 2	Donnybrook ... ..	1899	26 5 0	76 10 0	2 18 6
1	Donnybrook No. 1 South ...	1899	26 10 0	39 10 0	1 9 19
7	Duke of Wellington ... ..	1899	1 0 0	0 12 6	0 12 6
3 & 11	Hunter's Venture ... ..	1898	10 0 0	9 10 0	0 19 0
		1899	101 0 0	56 1 0	0 12 2
	Total ... ..	...	111 0 0	65 11 0	0 12 19
5 & 13	Queen of the South ... ..	1899	104 19 0	299 2 0	2 17 0
C.L. 2	Perseverance ... ..	1899	4 0 0	2 12 0	0 15 0
pp. 14	Star of the West ... ..	1899	5 0 0	1 0 0	0 4 0
			312 14 0	496 10 6	1 12 2
	Alluvial Gold ... ..	...	...	30 2 0	...
	Grand Total ... ..	...	...	526 12 6	...

The value of the gold varies from £3 3s. to £3 16s. per ounce.

THE GEOLOGY OF THE "NORTH LEAD," KANOWNA.

This report is intended to describe the geological features of what is known as the Kanowna North Lead, and is accompanied by an explanatory geological map, Plate VI., and four sections, Nos. 1, 2, 3, and 4, showing the structure of the deposits.

RESUME OF THE HISTORY OF THE KANOWNA MINING DISTRICT.

The Kanowna Mining District lies in the North-East Coolgardie Goldfield, distant about 12 miles East from Kalgoorlie, and 397 miles East from Fremantle, being connected with both places by rail.

The field first came into prominence from the discovery of rich quartz reefs and leaders which were found outcropping on the higher grounds to the North of the present townsite. Subsequently surface alluvial deposits were profitably worked by "dry blowers" in the same neighbourhood. During the year 1893 a fresh discovery of auriferous beds was made in the lower grounds to the East. These beds were locally known as the Golden Cement Leases.\* The discovery of this last-named deposit doubtless led the prospector to search for similar deposits in other parts of the field. In the early part of the year 1897 two prospectors, Messrs. Sim and Greson, whilst prospecting for alluvial gold on the Western watershed, discovered that auriferous deposits occurred underneath the surface stratum, which, up to this time, had been considered to be alone of sedimentary origin, the thin bed of hard travertine beneath having been mistaken for the true bottom, or rocky floor upon which the superficial deposits rest. This discovery led to the opening out of the Fitzroy Lead. After this it became simply a matter of following the Fitzroy Lead, the tracing of which enabled the miner to discover the North Lead and its tributaries, the Cemetery, and Wilson's Gully Leads. In the following year (1898) further developments took place to the North and North-East, where the Q.E.D. and Moonlight Leads were discovered, and there seems every reason to suspect that similar discoveries will yet be made in the Southern portion of the field.

GENERAL GEOLOGICAL DESCRIPTION OF THE COUNTRY IN THE VICINITY OF THE NORTH LEAD.

Covered as much of the field is with superficial deposits, most of the structural features are hidden from view, and as prospecting has not been carried on here over any great area, the underground workings do not give much scope for geological investigation. On the higher grounds lying to the South and West of the North Lead, however, the outcropping rocks show the country rock to consist of schists, which are intersected by acid eruptive dykes, the latter embracing the felsitic and quartz porphyry types.

\* For a description of this particular deposit *vide* (a.) "The Alluvial Deposits of Western Australia," by T. W. Richards, State Geologist, Denver, Colorado. Transactions of the American Institute of Mining Engineers, Buffalo, October, 1898. (b.) "Auriferous Deposits of Western Australia," by H. Y. L. Brown, Government Geologist, Adelaide. By Authority, 1886.