

necessary to examine a very large extent of country, which embraced an area of about 10 miles in length by about 6 in breadth.

A plan has been made by Mr. Campbell, with the object of throwing light on the proposal for prospecting the reefs at a depth. This plan shows the position and extent of all the reefs of the district, and, wherever possible, the amount and direction of their underlie.

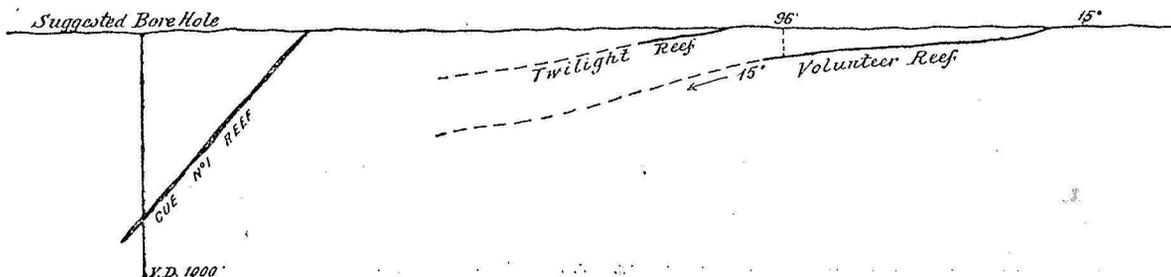
In the year 1897 I visited Cue at a time when enterprise seemed to be on the wane, and the returns showed signs of falling off. It was then pointed out in an official report\* that—"The Cue district in its geological structure is identical with that of the other productive goldfields in Australia and elsewhere, . . . There is no falling off in the supply of ore available for crushing in the district as a whole, although there are local variations in the dimensions of the reefs in almost every case. . . . So far, the reefs have shown themselves to be well defined fissure veins, in some cases, of large size, and, as such, are likely to be as persistent in depth as anything in the nature of reefs ever can be. Local fluctuations in the gold yield per ton are, of course, only to be expected in the future, but there are no scientific grounds for believing that such large and well-defined reefs as those at Cue have, on the whole, shown themselves to be, will not prove equally productive when followed to greater depths." This condition of affairs still obtains.

The reefs of Cue and Day Dawn are arranged along certain well-defined lines, which have been delineated on the plan, and their assumed continuity indicated.

After giving careful consideration to the whole question, it was recommended that (bearing in mind the general considerations which should determine the granting of State aid in this direction) the best assistance that could be rendered would be by means of a bore put down to the West of the Volunteer leases, just North of the township of Cue, at such a distance as would enable the drill to intersect the reefs at from 800 to 1,000ft.

Over this area there are certain well-defined and persistent parallel reefs which all underlie generally to the Westward. The Volunteer and the Twilight reefs both underlie to the Westward at an angle of  $15^\circ$  from the horizontal. The Cue One reef, which outcrops some distance to the West, underlies in a similar direction at an angle of from  $50^\circ$  to  $60^\circ$ .

A bore put down at a point about five chains East of the North-East corner of G.M.L. 217 would demonstrate the relation which may be called the horizontal reefs bear to the highly inclined. In such a bore the Cue One Reef, its present strike being measured, should be met with at about 800 feet from the surface. The Twilight Reef, if continuous, unless cut off by that last mentioned, should be met with at about 500 or 600 feet, and the Volunteer at about 300 feet lower down.



SECTION SHEWING THE POSITION OF THE VOLUNTEER, TWILIGHT AND CUE NO. 1 REEFS.

In view of the fact that any boring carried out would confer a direct benefit upon the holders of the leased land adjoining, it was further suggested that a contribution on their part, on a basis to be mutually arranged, would not be unreasonable.

The Warden provisionally reserved such an area as would include the ground operated upon.

Lennonville, Boogardie, and Mt. Magnet.—During the year a short visit was paid to Lennonville, with the object of investigating its mineral resources.

It was found that the auriferous deposits were of two distinct types—viz., white quartz reefs and banded quartz or jasper veins (which in some cases proved to be exceptionally ferruginous), approaching very closely the banded hematite-bearing quartzites, which form such a conspicuous feature in some portions of the Murchison. The white quartz reefs present all the characteristics common to deposits of this nature; they are of later formation than the banded quartz veins, for in many cases they intersect the latter. These laminated quartz veins form the principal feature of the district, and, so far as they have at present been worked, have proved to be rich in gold, though it cannot be said that they have had that prospecting which their importance warrants.

The two types of deposits bidding fair to become of economic importance, it seemed that the greatest assistance the Department could render to private enterprise in the district would be in the direction of mapping these formations, in the hope of furnishing a reliable guide for the conduct of the operations of the prospector and the mining engineer.

From an examination of the Lennonville district, it was found that the ore deposits exhibited a remarkable parallelism, having a general North and South trend. They were found to sweep across country, with scarcely any interruption, for about four miles, and to extend both North and South far beyond the limits of the inspection.

\* Cue Water Supply for Crushing Purposes. Perth: By Authority, 1897, p. 6.

A map, embracing an area extending from  $11\frac{1}{2}$  miles North, three and a-half miles South, two and a half miles West, and one mile East from the Lennonville Post Office, embodying the results of this work, was issued to the public in the month of September.

It was deemed desirable that the Southern extension of these deposits in the direction of Mount Magnet and Boogardie should be mapped and reported upon; this work was entrusted to Mr. Gibson. The area embraced by his labours extended over about 36 square miles. Upon the map, which is now being prepared for the lithographer, there are shown all shafts, alluvial workings, existing leases, the strike and underlie of all the reef and ore bodies, in addition to the geological boundaries, so far as they can be followed.

The main auriferous series is enclosed in a belt of more or less highly altered greenstones, which extend in a general Northerly direction from West Mount Magnet, through Moyagee, and as far North as Lake Austin and the town of Cue. The belt attains a maximum width of about 15 miles. This belt is composed of rocks, for which the term Greenstone has been provisionally adopted, and includes diorite, pyroxenite, together with hornblende and chloritic schists, which may merely represent the crushed or plated out variety of the former, induced by shearing. Owing to the paucity of natural sections, it has been found impossible to distinguish on the map, or even trace out the field, the relative area occupied by each, and further, mining operations have not been carried sufficiently far to afford much assistance in this direction. The Greenstones are intersected by numerous faults, and are also traversed by belts of laminated quartzites (cherts?), often highly ferruginous, which rise up from the surrounding country in the form of low ridges.

The Greenstones are bounded on either side by belts of Granite, from which small tongues of aplite emanate. In many portions of the district there are dykes of granite intersecting the greenstone. The foliation of the greenstone seems to have taken place prior to the intrusion by the granite.

The laminated quartzites (cherts?), which are exclusively confined to the greenstones, are of two distinct varieties, viz., the hematite-bearing, the purely silicious type; the former predominates in the neighbourhood of Boogardie, whilst the silicious type is more prominent at Lennonville. The deposits of the Lennonville type are practically vertical, and forms belts varying from two to four chains in width. They invariably carry gold, but not always in payable quantities; they are, however, traversed by numerous rich chutes, which are being worked with satisfactory results.

The deposits of the Boogardie type differ somewhat from those of Lennonville in that, at any depth yet attained, they prove to be more compact, and are in some places exceptionally magnetic, rendering work with a compass well nigh impossible. They are traversed by numerous faults, the mapping of which is of considerable importance from a mining point of view, in that it is along these lines that the rich chutes of gold for which the district is noted occur. The bulk of the gold has been found to occur in rich chutes where the faults intersect the quartzites. Wherever seen, these faults cross the strike of the quartzite at right angles, and as the latter are generally only about from 30 to 60 feet in width, it necessarily follows that the width of the chutes is small; they are never found to continue into the country rock in either wall. The fault fissures are invariably filled with brecciated quartzite, recemented with chalcedone quartz, and traversed by small angular quartz veins. The fissures vary from three to six feet in width.

The quartzites (cherts?) appear to have been old fault lines, or shear zones, along which thermal solutions carrying iron, silica, etc., have found their way to the surface.

The quartz reefs occur plentifully in both the granite and the Greenstone, though, as a rule, it is only those close to the Greenstone which have proved to be auriferous to any extent. The chutes in these reefs are short, but frequently rich. It is interesting to note that these quartz reefs often form the continuation of the faults by which the laminated quartzites (cherts?) are intersected.

So far as observations have at present been carried, these auriferous deposits of Boogardie bear a remarkable resemblance to those of Peak Hill and the Horseshoe. It is highly desirable, in the interests of the State, in view of the light conferred by the recent work in the Mount Magnet District, that when opportunity offers the Northern extension of this belt should be geologically examined with the view of showing its relation to the deposits of Nannine, Meekathara, and other districts in the North Murchison District.

The map and report on the Boogardie District will be shortly available to the public.

**Yalgoo.**—In accordance with instructions, I visited Yalgoo on my return from the Murchison, for the purpose of reporting upon the alluvial deposits in the more immediate vicinity of the Township.

The Township of Yalgoo lies in a broad valley, flanked on either side by low ranges composed of amphibolite rock, which seems to be the staple formation of the district. It is in this valley that deep alluvial ground has been held to exist. The valley is drained by a small watercourse, which carries all the water Southwards. The broad expanse of the valley is covered with a variable thickness of superficial deposits, some of which are partially cemented into solid rock. The dam at the Railway Reserve shows the nature of the "cement."

The Public Battery water shaft is reported to have met with "alluvial wash" in a drive which had been put in from the bottom, but no gold was apparently obtained. I visited the site of the shaft, which is at present inaccessible. From what can be seen at the present time, it would seem that the sinking was through (below a few feet of superficial deposits) decomposed amphibolite of the type prevailing in the district. There is no evidence as to the existence of "deep alluvial" in the shaft. I incline to the belief that the "wash" encountered in the drive is nothing more than a belt of decomposed fault rock containing rounded and sub-angular fragments of the surrounding rocks. In many places along the flat in the valley the country rock is exposed at the surface. This, coupled with the evidence