

In addition to the publications previously alluded to, there have been lithographed the following mining and geological plans, which are designed to accompany the report upon the Norseman District, which has now been completed :—

- Plan and Section of the Princess Royal Gold Mine. Scale, 100 feet per inch.
- Plan and Section of the Norseman Gold Mine. Scale, 100 feet per inch.
- Plan and Section of the Cumberland Gold Mine. Scale, 100 feet per inch.
- Plan and Section of the Lady Mary and Valkyrie Gold Mines. Scale, 100 feet per inch.
- Geological and Topographical Map of Norseman. Scale, 20 chains per inch.
- Section from Lake Cowan to Dundas. Scale, 20 chains per inch.

PRINCIPAL RESULTS OF THE YEAR'S FIELD OPERATIONS.

MINERAL RESOURCES.

Pilbara Goldfields.—A more or less detailed examination of the mining centres of Glenroebourne and Weerianna was made by Mr. Talbot, the field assistant, and a full report upon the districts is in course of preparation. The mining centres of Station Peak, Tambourah, Western Shaw, Just-in-Time, and the newly opened tinfield of Wodgina were also investigated, and in addition a traverse from Croydon Station southward to the Hamersley Range afforded an invaluable opportunity for ascertaining something of the structural relationships of the different formations and the natural resources of a portion of the State of which little is known geologically. Full details as to the districts visited will be found in the report which is in course of preparation.

Wodgina Tinfield.—In accordance with telegraphic instructions conveyed to me at Whim Creek, I proceeded to Wodgina and in due course submitted the following interim report on my observations on the field, the examination of which occupied my close attention for about a month :—

The Wodgina Tinfield is situated on the headwaters of the western branch of the Turner River, and within the limits of the Pilbara Goldfield, about 74 miles from Port Hedland.

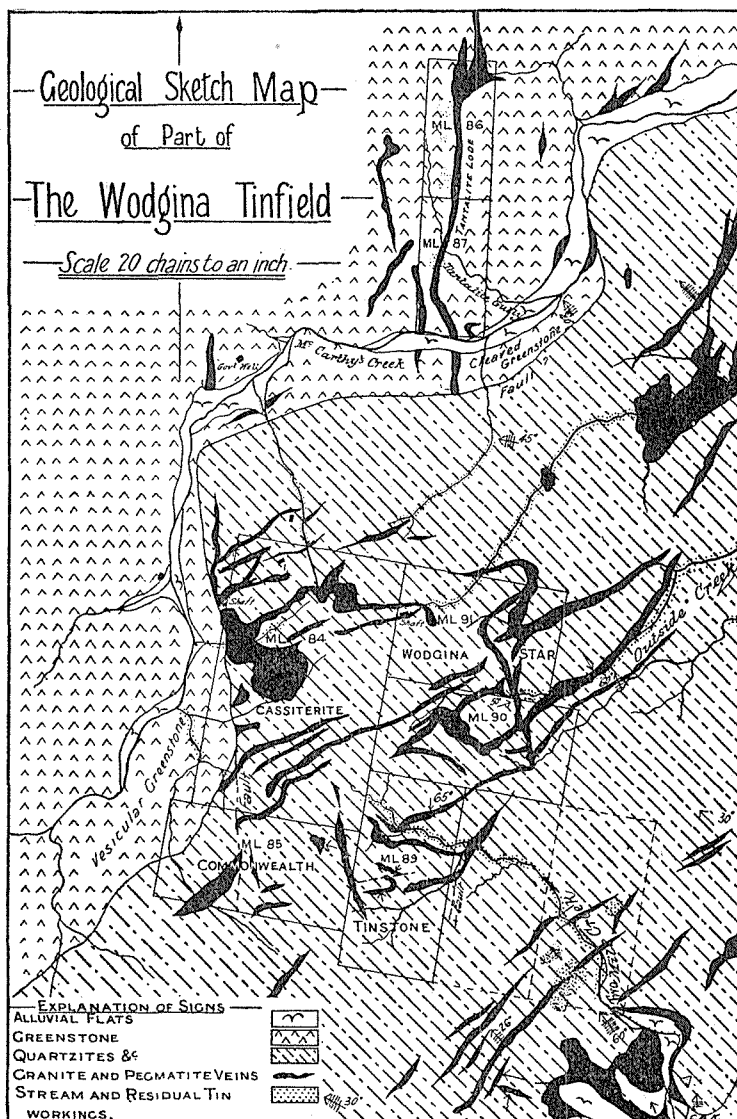


FIG. II.

Geologically, the field consists of a series of sedimentary and bedded igneous rocks, skirting an extensive granite mass which occupies a very large area of country. These sedimentary beds are very much faulted and have a prevailing dip to the west; they occupy a very rugged range, which rises to considerable altitudes above the level of the surrounding plains.

The sedimentary rocks are pierced by granite and pegmatite veins (in reality offshoots from the mass previously described), which invariably form the matrices of the tin and tantalite ores.

Wherever the pegmatite veins have been opened up it is invariably found that the tin occurs on either wall of the vein, in a band (of more or less width) consisting of mica and tourmaline in varying proportions, though in one case the occurrence of tin ore in the vein itself was noticed. The bed of the ravines and the slopes on the hill sides carry detrital and residual tin and tantalite everywhere over the whole area occupied by the granite and pegmatite veins. These latter have been mapped in some detail, and should afford a valuable guide to those engaged in mining operations on the field. Attached to this report is a copy of the material portion of the geological and mining plan of Wodgina. A careful inspection of the surface and plan (Fig. 2) attached shows that the tin lodes are numerous, and occupy a considerable area of country; it, however, yet remains to be proved whether they can be profitably mined, for operations have yet hardly gone beyond the most rudimentary prospecting stages, and no material progress can be made without capital to provide the necessary equipment for properly opening up and mining the lodes.

From a careful examination I am of opinion that the district bids fair to rise to importance, and that it will continue to be a tin and tantalite producer.

A very important feature of the Wodgina field is the tantalite lode, the position of which is accurately shown on the plan which forms Fig. 2. The "lode" traverses the whole length of two of the leases applied for, viz., 86 and 87. Upon the most southerly of the two not much work has been done, operations having been confined to dryblowing the surface along the outcrop and in the vicinity of the pegmatite vein. The principal activity is centred upon the ground embraced within the limits of M.L. 86. The pegmatite vein (the lode) has been opened up for a length of 45 feet, but only to a depth of three or four feet, and exposes coarse fragments and crystals of tantalite; one fragment weighed a little over four hundredweight. To the west of the open cut its width is 41 feet, whilst 264 feet farther its width is 34 feet. It is not possible from the amount of work done to ascertain the thickness of the vein, nor the actual amount of its underlie. A commencement has been made with the sinking of a shaft in the open cut, and as operations proceed definite information upon these material points should soon be available. It may be mentioned that the lode is in "greenstone country" and not in sedimentary rocks as is the case with the tin lodes yet opened up. A considerable amount of dryblowing is being carried out upon the slope of the hill adjoining and to the west of the lode. Several tons of tantalite (some of it being very coarse) have been obtained in this manner, and it is estimated that about 18 tons of the mineral have been taken from the surface of the lease. This detrital tantalite results from the disintegration of the rich chute in the vein adjoining.

Owing to the kindness of Messrs. McGuinness and Naysmith, the representatives of the lessees and the dryblowers respectively, the departmental collection has been enriched by about 1cwt. of tantalite specimens now in the Survey Museum.

About 300 feet to the west of the main tantalite lode is a smaller pegmatite vein, containing tantalite. Dryblowers have been at work near the southern end and have obtained about 1cwt. of the fine-grained mineral.

What may be called the tantalite group of lodes has been followed with more or less interruption for about a mile to the north of the Tantalite Lease 86; it eventually merges into the granite underlying the plains. A fair quantity of detrital tantalite has been obtained from this locality, and I have every reason to believe that the area over which the mineral occurs will be extended. I did not deem it necessary to devote any further time to the mapping of the extension of these veins, seeing that other portions of the district required attention, and the field season was rapidly passing away.

Having due regard to the uses to which recent scientific research has proved the metal can be put, provided the tantalum-bearing minerals can be obtained in sufficient quantities, the find at Wodgina is of considerable importance and should be the means of encouraging prospecting in other districts in which identical geological conditions prevail. An analysis of the tantalite from Wodgina appears on page 21 of the Annual Report for the year 1904.* It is unnecessary for me to add that tantalite has been known in Greenbushes for a number of years, and full particulars of which have been available to the public in several of the Bulletins of the Survey.

According to the letter of the Warden accompanying Ministerial instructions of the 20th of June, and his letter to me of the 29th of the same month, it appears that some objection has been raised to the granting of leases on the grounds that "it is alluvial country." My attention was naturally directed to this question, and for the purpose of your guidance a copy of a portion of the Geological and Mining Map of Wodgina, which it was essential should be prepared, is attached (Fig. 2). Upon this map there have been indicated:—

- (a.) The water-courses, and the portions which have been worked;
- (b.) The tin and tantalite lodes (i.e., the pegmatite and granite veins);
- (c.) The only lease granted, M.L. 84;
- (d.) The leases surveyed but not approved, e.g., 91, 90, 89, 85, 86, and 87;
- (e.) Certain leases applied for but not yet surveyed or approved; and
- (f.) That portion of the field, as yet unapplied for, which I should advise being withheld from lease, until such time as some competent officer certifies that the alluvial ground thereon has been worked out.

* Further particulars regarding tantalite will be found on page 20 of this report.

(For the purpose of considering the objections raised to the granting of mineral leases, it is necessary to bear in mind that "alluvial ground" is that which is defined in the Mining Act.) There is only a very limited area of detrital deposits in the gullies and ravines and such are only narrow, and in no case of any depth. On the low slopes of the main range, to the east of the Cassiterite lease, there are numerous veins, which have shed a fair quantity of tin (and a little tantalite), which now lies not far from its parent source, and should, I think, be withheld from lease until such time as some competent officer certifies that the ground (which is but shallow) has been worked out.

Despite the fact that the surface of the country is traversed by lodes and contains more or less tin set free by their disintegration, the field cannot be said to constitute an alluvial field, differing in this respect (and geologically) from that of Moolyella previously reported on.

Mt. Margaret Goldfield.—During his work on the Mt. Margaret Goldfield, Mr. Assistant Geologist Gibson examined and reported upon the following centres:—Laverton (including Lancefield and Ida H.), Burtville, Erlistoun, Duketon, and Mulga Queen, in addition to which a brief examination was made of the country between these centres. Geological sketch maps have been prepared, on a scale of 20 chains to an inch, of Laverton, Lancefield, Ida H., and Burtville, and black and white maps on a similar scale, showing the position of the principal lines of reef at the centres of Erlistoun, Duketon, and Mulga Queen. In addition to this work an examination was made of the country at the Cosmo Newberry Ranges and thence to Mounts Shenton, Venn, and Warren, and on to the Ulrich Range at the south end of Lake Wells. Mr. Gibson has prepared the following brief description of the salient geological features of the principal centres examined:—

"**LAVERTON** (including Lancefield and Ida H.).—This centre is the present terminus of the Eastern Railway. The salient geological features are practically identically similar to those of Mt. Morgans, which has already been dealt with in detail by Mr. Jackson in Bulletin No. 18. The staple formation consists of a series of basic and acidic rocks, of which the basic occupy by far the larger area. The basic rocks, the greenstones, are essentially hornblendic and occur both massive and schistose, being similar to those usually found forming the auriferous series of the Eastern Goldfields. It is within these greenstones that the auriferous reefs and lodes are found to occur. The acidic rocks vary through felsites, felspar-porphyrries and granites, and occur chiefly as dykes and intrusive masses, being most largely developed at the north end of the district in the vicinity of Lancefield. A few small deposits of laterite (ironstone conglomerate) occur, forming the cappings of low greenstone hills and ridges, but is mostly of an inferior grade. The greater part of the area under examination is covered by a varying depth of recent detrital deposits, which render detailed mapping extremely difficult, and on this account many of the geological boundaries may be looked upon as purely arbitrary. The ore deposits, like those of Morgans, can be divided into two classes:—

"(a.) Lodes which are genetically similar to the banded and hematite-bearing quartz lodes which form so conspicuous a feature of the Murchison and Mt. Margaret Goldfields.

"(b.) Gold-bearing quartz reefs of the normal type.

"Most of the principal mines are working on deposits of the first class. The district as a whole is well watered, but timber is not too abundant and is rapidly becoming exhausted.

"**BURTVILLE.**—This centre differs from the majority of West Australian mining districts as yet opened up, in that the majority of the auriferous quartz reefs are found in an area of granitic rocks. This area occupies a roughly circular extent of between one and two miles in diameter, and is situated entirely within the greenstones, into which it appears to be intrusive; it has also apparently been subjected to the same strains as the greenstones, and the reefs in it almost without exception run parallel to those found in the adjoining greenstones. The greenstones, which occupy the larger portion of the field, are of the usual type and consist both of massive and foliated varieties. Both they and the granites are very much decomposed and weathered, such weathering continuing well below the deepest mine workings (about 200 feet). The greater part of the district is covered with recent detrital deposits, often to a depth of 20 or 30 feet, and this renders accurate detail mapping almost impossible; very few of the reefs outcrop; floaters are picked up on the surface and the reefs are found by deep costeaning, or sinking and crosscutting, the soft nature of the country rendering this a fairly easy undertaking. The reefs are of white quartz and are numerous, but small (4 to 10 inches), and almost invariably rich—five and 10 ounce crushings being of common occurrence. This fact, taken together with the soft nature of the country, renders it an ideal district for prospectors but not of much use to companies, there not being sufficient stone procurable to keep any sized crushing plant continuously at work. Fresh water is abundant on the field, but timber is scarce.

"**NORTH ERLISTOUN.**—This district embraces the centres of Erlistoun, Duketon, and Mulga Queen. Mining is very slack, with the exception of the last centre. The salient geological features are much the same as those of most of the other mining centres of the Eastern fields. At Erlistoun are found the banded and hematite-bearing quartz lodes traversing the greenstones in a general north and south direction. Here, although auriferous, they have not proved sufficiently so to pay for working. The reefs being worked throughout the three centres are white quartz reefs of the normal type; they are usually of fair size and often of considerable length. They occur without exception in the greenstones, and at Duketon appear to be along the junction of the greenstone schists with a granitic rock, though the country is so decomposed and rotten that it is almost impossible to discriminate between the two classes of rock. There is an abundant supply of fresh water throughout the district, and timber of good quality is fairly abundant.

"**COSMO NEWBERRY RANGES and MOUNTS SHENTON, VENN, and WARREN.**—A detailed examination was made of the country at these centres, as well as of the country at the Ulrich Range on the south end of Lake Wells.