was raised, but of what extent the latter are it is impossible to state, since without means of descent no inspection can be made, besides which the old workings are at present quite unsafe. It is evident that a considerable quantity of ore must have been removed from this mine, since the road from the workings, which has not been used for the last 30 years, shows signs of heavy traffic, whilst further, the ore must have been of high grade because little refuse is met with in the spoil heaps. The galena appears to have been practically all removed, but the carbonates were discarded, since a considerable quantity of the latter still remains at the surface. There is an abundant supply of water for dressing purposes, whilst timber for mining purposes and fuel is abundant. The position of the property reduces cartage to the lowest limits, whilst the 9-mile railage to a port is greatly in its favour. It is quite impossible, under the circumstances, to make any definite statement with regard to this property, but to judge from surface indications there is a reasonable probability of it containing minerals in payable quantities at the present market value of lead."

WAGIN.

"In consequence of the discoveries in the vicinity of Wagin, Mr. Woodward was deputed to visit and report thereon. In the month of April, this officer submitted the following report :—

"The discovery is upon Mr. H. W. Spragge's property 1010/56, which is situated about two miles south of Badgarning Hill and four miles west of Wagin (*see* Crown Lands litho. 409/80).

"From Badgarning Hill, which is a bold granite outcrop, the country falls rapidly in a southerly direction, the surface being covered by a feldspathic and micaceous grit indicative of its derivation from the disintegration of granitic rocks.

"In the vicinity of the find no rocks outcrop, but the surface is strewn along a well-defined line which runs in a north-east and south-west direction with fragments of a granular ironstained quartz from which the first prospects are said to have been obtained.

"Upon the eastern side of this blow a shaft has been sunk to a depth of 20 feet (water level) in white quartz and kaolin. From the bottom of this shaft a crosscut has been driven 35 feet north-west through a kaolinized rock with bands of quartz, many of which are ferruginous. At this point what is apparently the main formation was cut and driven upon 30 feet south-west and 15 feet north-east, whilst the crosscut was continued in quartz and formation for a further distance of 12 feet, thus, including the level which is 7 feet wide at this point, 19 feet of quartz veins and formation have been proved to exist.

"Some of the quartz veins are large, barren, and white, yielding no prospect of gold, but associated with them are ferruginous veins which yield prospects of fine gold.

"At the point where this formation was first cut in the crosscut there appear to be indications of a footwall dipping to the north-west, but so far no hanging wall has been met with.

"A short distance south of the shaft the formation has been crosscut by a trench, samples from which yielded prospects of fine gold.

"So far as can be judged from the character of the stone in the oxidised zone, the gold will most probably be carried in veins of pyritic quartz below the water level.

"The ferruginous quartz and formation yields fine colours of gold with a dish, as do also the sands of the creek to the southward.

"The following is the result of the sampling:—

"*No. 1,* from the north side of the trench, 6 feet in width, gold: 4 dwts. 2 grs. per ton.

"*No. 2,* from the south side of the trench, 6 feet wide, gold: 4 dwts. 22 grs. per ton.

"*No. 3,* from the north drive, 3 feet wide, 10 grs. per ton.

"*No. 4,* from the south drive, gold: *nil.*

"*No. 5,* from the face of south drive, 4 feet wide, gold: minute trace.

"*No. 6,* from dump, gold: minute trace.

"From the above it will be seen that the results of the sampling of the shaft workings is not at all encouraging, but that from the trench is much more so; since however it proves conclusively that a formation of six feet in width carries between 4 and 5 dwts .of gold to the ton, it is decidedly worth further prospecting .

"With this object in view, and in order to avoid expending labour upon barren ground, it would be advisable to prospect the cap of the lode at distances of 50 feet by shallow trenches, average samples from which should be tested; after which a shaft should be sunk at the point where the lode proved to be of the highest value; this shaft should be at least 50 feet deep, from which the lode should be crosscut and driven upon.

"At the present time an examination can only be made with the object of ascertaining whether gold really does exist, and this end has been attained, the results not only proving that gold does exist, but in sufficient quantity to encourage further prospecting. When this work has been carried out, another inspection could be made, since it then might be possible to express a much more definite opinion than it is at present."

The following are the results of the Mineralogist and Assayer's assays of the samples from Wagin:—

L 1899, W. 1.—Gold, 4 dwts. 2 grs. per ton.

L 1900, W. 2.—Gold, 4 dwts. 22 grs. per ton.

L 1901, W. 3.—Gold, 10 grs. per ton.

L 1902, W. 4.—Gold, *nil.*

L 1903, W. 5.—Gold, minute trace.

L 1904, W. 6.—Gold, minute trace.

Acting under my instructions, the Assistant Geologist, Mr. W. D. Campbell, visited Wagin, and in August submitted the following report upon the recent mining developments at that centre:—

"I visited Messrs. Spragge and Murray's reward lease on the 2nd inst. Since Mr. Woodward's report of the 9th April a second vertical shaft has been sunk to a depth of 55 feet at a distance of 77 feet south-west from the first shaft, at the place in the

costeen where some gold was found to occur. Water had been allowed to accumulate in both shafts, and stood at normal height, about 20 feet below the surface. At the time of my visit I was therefore unable to examine the workings. The owners informed me that practically no work had been done at the first shaft since Mr. Woodward's report. In regard to the second shaft, they state that the first 40 feet was wholly in quartz which included seven ferruginous bands, about two feet apart each, then the footwall was met with underlaying north-westerly; below this there were 15 feet of stiff kaolin and then a parallel rubbly quartz vein, 18 inches wide, which showed gold. This vein was not driven on, however, on account of water At 50 feet depth a crosscut was made northerly for 15 feet; here a drop of 7 feet was made (I presume to the footwall again), and the crosscut was continued again for 15 feet without meeting the hanging wall. Ten tons of ore obtained from this development work were treated at the Coolgardie State Battery and yielded 5 ozs. 14 dwts., which is at the rate of .57 oz. per ton (11 dwts.). Mineral specimen No. 1 in the accompanying list was obtained from the north side of the shaft at 2 feet depth; it is an opaque whitish quartz of the usual type in the district, and is very similar to those near Beverley. Mr. Murray informed me that I was taking this sample from the poorest part of the reef, it however assays minute traces of gold. A new shaft has been begun 59 feet north-westerly from the second shaft. From what I could see of the reef, it appears to be underlaying 50 degrees in that direction, with a strike of 223 degrees, but the latter is somewhat uncertain. About 2 chains north-easterly from the No. 1 shaft a costeen has been made across the line of reef and shows quartz similar to the bulk of the quartz in the two shafts.

"I may remark here that the workings appear to be in a very insecure state, through the absence of timbering.

"Sinclair's prospecting area, No. 3, adjoins the north-east end of Messrs. Spragge and Murray's ground; here some trenching is being carried out. In one trench there is a layer of well worn quartz pebbles at 2ft. 6in. depth; the trenches are down to a depth of four feet in the slightly ferruginous kaolin, but the cap of the reef has not yet been found. About 7 or 8 chains north from here there is an outcrop of a glassy quartz, which probably belongs to different line of reef (*see* Collection Nos. 14 and 16).

"Another prospecting area, No. 7, has been taken up about half a mile farther north-easterly on what may be a reappearance of Spragge's reef.

"About half a mile northward of this are Prospecting Areas 8 and 9, where there is an outcrop of whitish quartz; a small pothole only has been made here as yet. Sample No. 3 in list is from here; the strike of the reef is 25 degrees. This reef outcrops again in Loc. 3996, south of Mr. C. A. Piesse's house, and one mile due north of this again there is an outcrop of a white quartz; this is probably another parallel reef, strike 33 degrees, with cross-jointing 70 degrees; this has been taken up by Messrs. Conder and Gill, but no work has yet been done on it . Two miles farther north-easterly, on the west side of the Railway, is Messrs. Bailey and party's ground in Loc. 4245, which I did not visit, as only a little trenching had been done there.

"Three miles south-west of Wagin in Loc. 3632 is Messrs. Doig and Hanke's ground, in which there is a well-defined outcrop of quartz forming a slight ridge, striking about 35 degrees. The reef is about 24 feet wide and has cross-jointing 95 degrees. A costeen was being made across the reef, with a depth of 4ft. 6in. The quartz has ferruginous portions, and somewhat resembles Spragge's reef. Collection No. 2 is from the bottom of the middle of the trench, but does not assay any gold.

"Prospecting Areas Nos. 5, 10, and 11 are on the west side of the main line of railway about 2½ miles south of Wagin in Loc. 1804, where a low ridge indicates the line of reef for over half a mile striking 29 degrees, but towards the south end the reef deviates to 57 degrees. Messrs. Mann and Hawkins have made two costeens across the reef about 135 feet apart. The northernmost of these is about 4 feet deep, and shows the quartz mixed with partings of a dark coloured gossan. The walls of the reef are not clearly shown in the costeen, but the width of the reef is evidently over 30 feet. Some good prospects are stated to have been obtained from the drillings here. Samples Nos. 8 and 9 were obtained from about mid length in the costeen at 4ft. depth, and were selected as fairly representative samples of the quartz and gossan respectively; both have yielded minute traces of gold on assay.

"In the southern costeen, the quartz reef is solid and whiter, but the average depth would be little more than 18 inches. At the west end a shaft has been begun in the decomposed granite on the side of the reef, and was about 5 feet deep. This shaft will follow the reef underlay to the east. The reef is at least 37 feet wide here, and as the eastern end of the costeen shows rubbly quartz, the width may be more than this. There are three slightly ferruginous bands at 10, 26, and 32 feet from the west side. Sample No. 7 is from the centre at 10 feet, Nos. 5 and 6 are from the north and south sides at 26 feet, and No. 4 from the centre at 32 feet, and all except the last assay minute traces of gold. The ferruginous bands are usually the most favourable portions of the reef. About 7 chains north of these two there is another smaller costeen showing similar quartz.

"Three miles northwards from here on the east boundary of Wagin Townsite, and in Mr. Just's Loc. 518, is an outcrop of quartz, which may be a continuation of Mann's reef. It strikes 27 degrees, and a costeen about 20 feet long and 4 feet deep has been made by Mr. Simms across it at the top of the rise. Prospects of gold are stated to have been obtained from the surface stone here. My samples also from the surface, as the trench was full of water, have not yielded any gold (*see* Nos. 12 and 13).

"There are other outcrops of reefs in or parallel to the line of Spragge's reef for some miles south-westerly; one or more occur in Gleeson's holding (Loc. 953?) four miles from the reward lease (*see* sample No. 10), which shows minute traces of gold. Two miles farther, quartz rubble occurs on the east side of Loc. 2109; some of this is very ferruginous (*see* sample 11), which however does not assay any gold.

"The only diorite dykes that I saw were some ranging from 3in. to 12in. thick, trending 122 degrees, which is nearly at right angles to the prevailing course of the reefs (*see* Collection No. 15).

"I took the opportunity to visit Lime Lake, and obtained two samples of the lime, and some of the small shells enclosed in the deposit, and took the three attached photographs showing the kilns owned by Mr. W. E. Clark.* Operations are suspended here during the winter months owing to the boggy nature of the ground around the lake. There are now ten special leases of about 25 acres each; these and the various prospecting areas and leases are shown on the attached litho plan 409/80 and 409/40 B. and C.*

"It is not possible in the present early stage of development to expess any very definite opinion regarding the further occurrence of gold in the district. The results from Mr. Spragge's mine are certainly very encouraging, and justify careful prospecting elsewhere around Wagin. Messrs. Spragge and Murray show their confidence by working their mine without outside aid, but better results would probably be obtained by opening up the mine on a larger and more systematic scale."

List of Mineral Specimens and results of Analyses, by Mr. E. S. Simpson.

G.S.L. No.	Coll. No.		Gold.
2266	1	Spragge & Murray's shaft, Loc. 1504	Minute trace
2267	2	Doig's costeen, Loc. 3632 ...	*Nil*
2268	3	Sinclair's P.A. 9, Loc. 617 ...	„
2269	4	Mann's costeen, Loc. 1804 ...	„
2270	5	„ „ „ ...	Minute trace
2271	6	„ „ „ ...	„
2272	7	„ „ „ ...	„
2273	8	Mann's costeen, 2½ ch. north of Nos. 4 to 7	„
2274	9	Mann's costeen, 2½ ch. north of Nos. 4 to 7	„
2275	10	Gleeson's reef, Loc. 953 ...	„
2276	11	Ferruginous reef, Loc. 2109 ...	*Nil*
2277	12	Just's Loc. 518, at costeen ...	„
2278	13	Just's Loc. 518, near townsite boundary	„
	14	Quartz outcrop, Loc. 1645	
	15	Diorite, Loc. 1566	
	16	Waterworn quartz pebbles, Sinclair's P.A. 3	
	17	Lime from small pit, Lease No. 4, shown in photo.	
	18	Limestone ridge, 3 chs. north of kiln, Lease 4, shown in photo.	
	19	Shells from limestone in lake bed, west of kilns	

"On the 22nd of August, an auriferous specimen, received through the West Australian Bank, was handed to me by you for inspection and report. After careful examination I submitted the following memorandum thereon:—

"In reply to your memorandum of the 22nd inst., which did not reach me until 4.30 yesterday, the specimen is not of the same type as that which characterises the quartz of any of the Wagin reefs known to me, neither does it in any way resemble the ore obtained by Mr. Campbell on the occasion of his recent visit to the locality, and referred to in his report. Owing to the condition in which the stone recently submitted by you for assay was received it is hardly possible to state whether it bears any resemblance to the sample accompanying your memorandum, and which is returned herewith. I may add, however,for your information, that I have very good grounds for suspecting that some of the rich ore purporting to have been obtained from certain of the Wagin reefs has come from a much more distant source."

* Not reproduced.

ARRINO AND YANDANOOKA.

Mr. Campbell submitted the following memorandum on some observations made by him in the vicinity of Arrino and Yandanooka during the year:—

"The Eastern boundary of the granite in the Arrino and Yandanooka districts is shown in two plates in the Departmental Report for the year 1903, reproduced from the map accompanying my report of September 30th in that year, on the Arrino Copper deposits; this embraced about six miles; since then the boundary has been traced as opportunity offered for a further distance of nine miles northwards to near the Yandanooka Railway Station. The illustrative rock specimens have also been extended, and they now number 52, nearly all collected by the Department. Their localities are shown on the map, and they are enumerated in the accompanying list.

"The sedimentary beds adjacent easterly to this granite are a series of sandstones and conglomerates, which are occasionally altered into quartzites; they have a general underlie of about 60 degrees to the east; with them are associated beds of fine-grained chocolate-coloured tuff or tufaceous sandstone; these occur mostly along the immediate contact with the crystalline rocks, and are plainly seen near Mt. Muggawa and northwards, blocks of travertine up to 12 inches thick occur frequently along its outcrop, and are burnt when required for lime: the calcareous nature of this tuff produces a fertile soil which has caused this ground to be sought for occupation. Both the sandstone and conglomerates are largely ferruginous and often capped by laterite, or occur as quartz conglomerates as at the hill misnamed Granite Hill at Yandanooka. The age of these beds have not yet been ascertained, but they may be Permo-Carboniferous.

"At Mt. Muggawa the lodes occur in the granite gneiss and mica schist, but at Arrino they penetrate the sedimentary beds in which they are dispersed into small veins of ore rarely more that half an inch wide. When I was at Arrino in January last ore was still being raised near Baxter's shaft on Block 342 by means of open cut, worked on tribute.

"The western margin of the granite area has not yet been mapped; it is much obscured by the sand forming the adjacent sandplains, which have apparently resulted from the decomposition of the more recent horizontal sandstones that have been deposited along the old coast line of granite and older sedimentary beds; with these sandstones occur argillaceous beds as at the Yandanooka homestead of Forrest, Emanuel & Co. and the valley of the Arrowsmith River (*see* 3 mineral specimens from there in the attached list). These clay beds cause springs to occur. The age of these beds may be Jurassic or Cretaceous.