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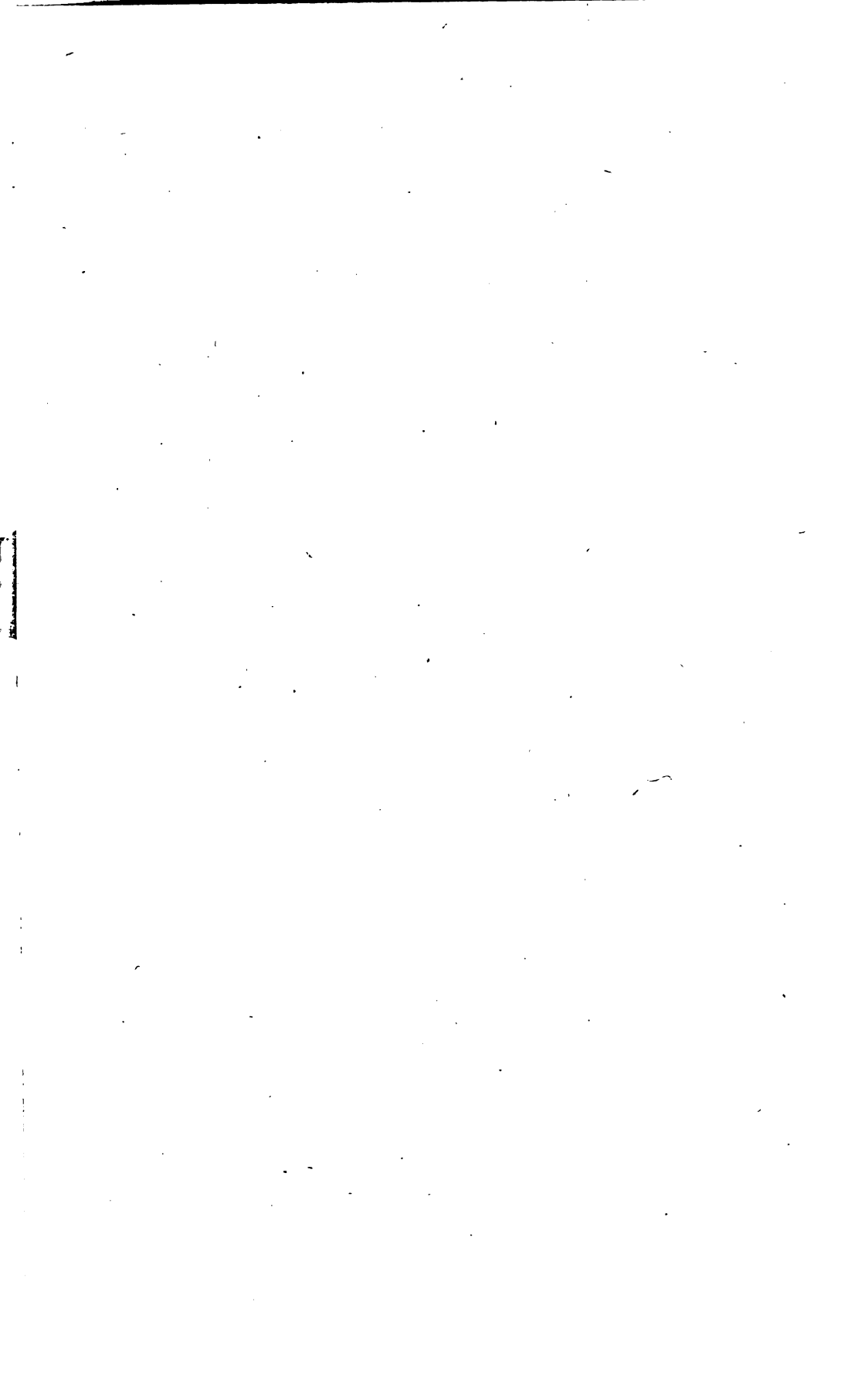
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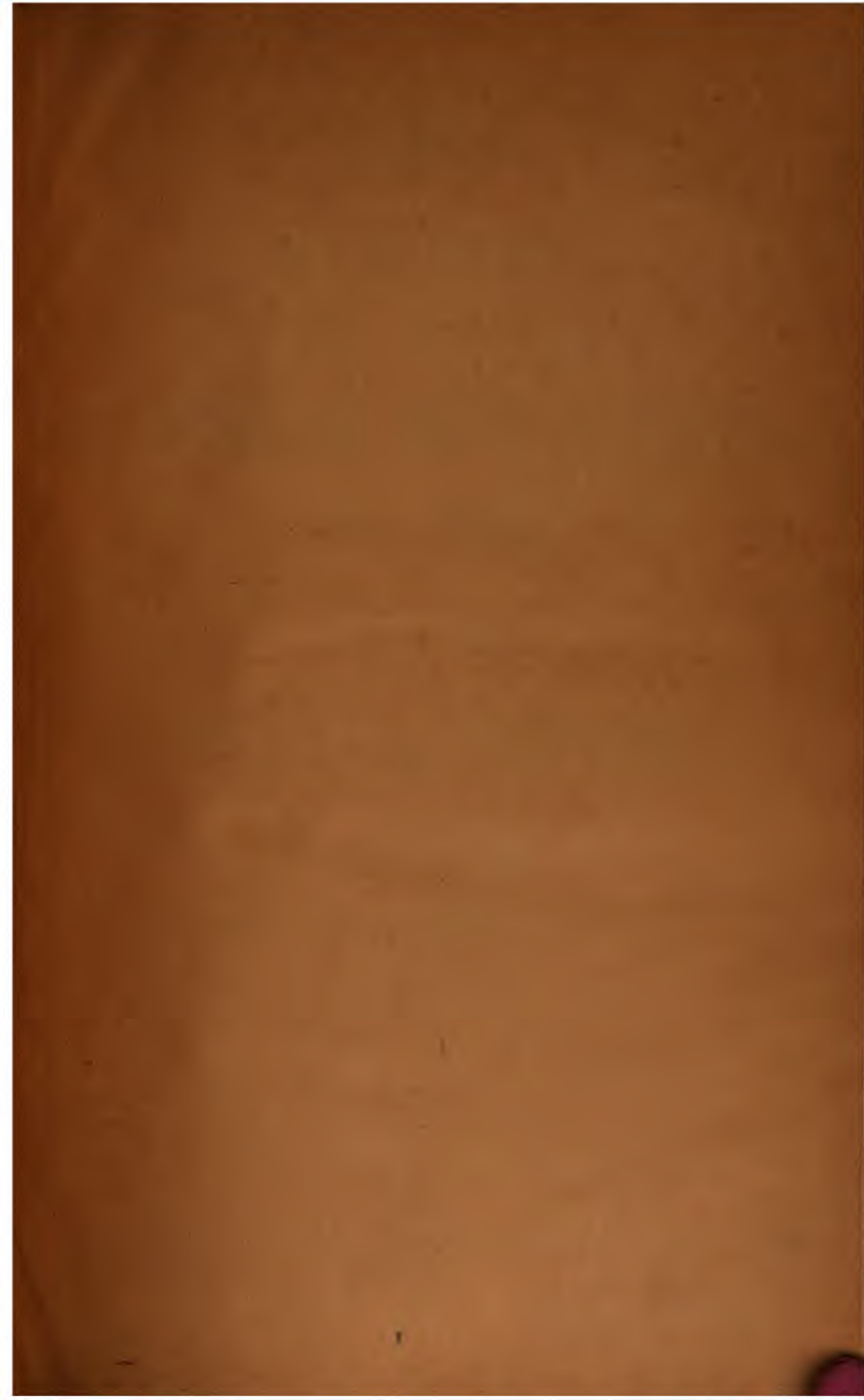
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1908



RECORD

OF

THE MINES OF SOUTH AUSTRALIA.

FOURTH EDITION.

555

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1908

Compiled, under the authority of the Hon. Laurence O'Loughlin, M.P., Minister of Mines,
by Lionel C. E. Gee, J.P., General Assistant and Recorder, Department of Mines.



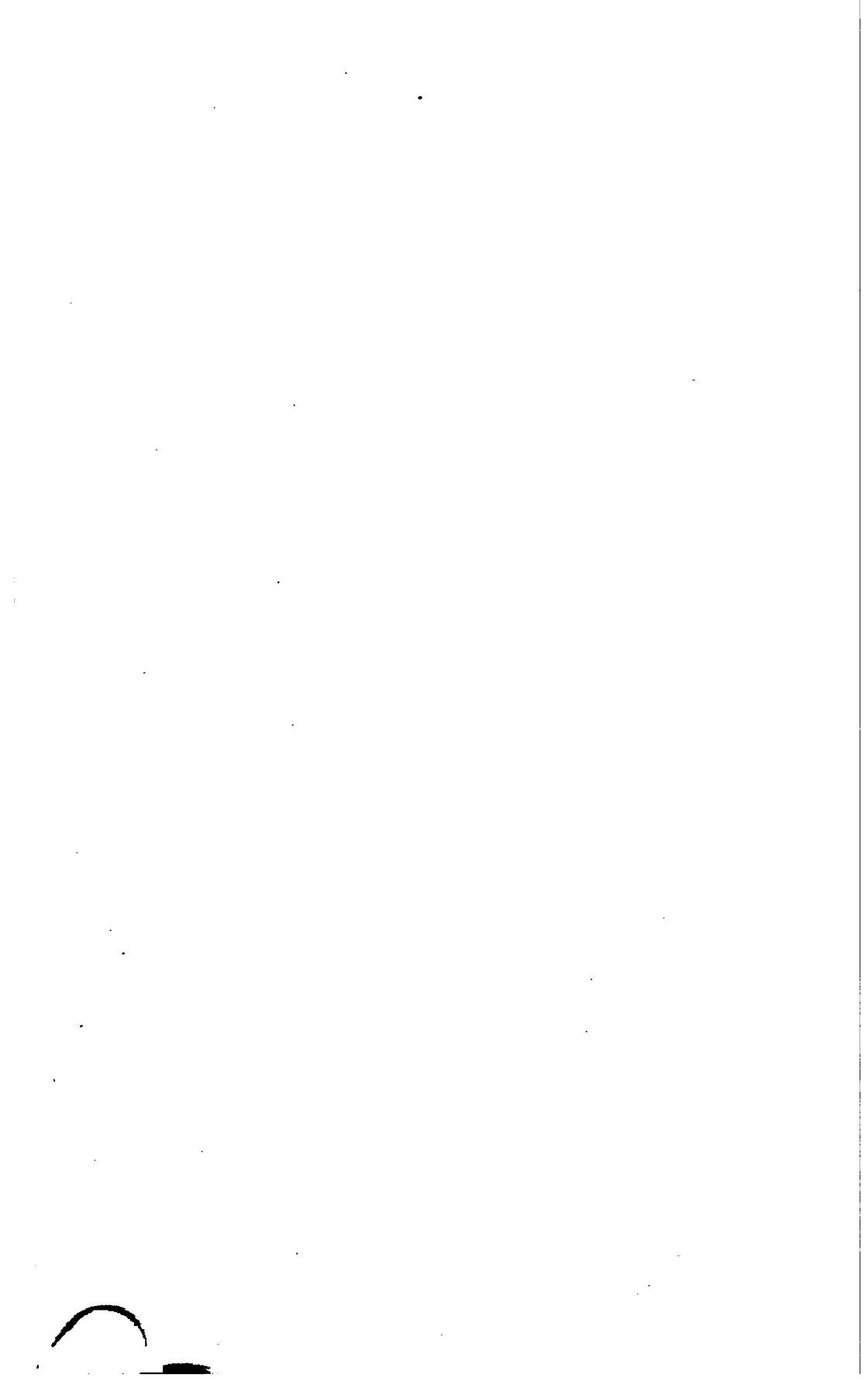
H. Y. L. BROWN, F.G.S.,

GOVERNMENT GEOLOGIST.

Adelaide :

BY AUTHORITY: C. E. BRISTOW, GOVERNMENT PRINTER, NORTH TERRACE.

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THIRTEEN

PREFACE TO THE FOURTH EDITION.

THE Third Edition, which was published in May, 1899, has been carefully revised, and, with the new information added, this Edition is about twice the size of its predecessor. Every care has been taken by Mr. Gee to make it as up to date and accurate as possible; but still it is felt that much information is lacking, and that gaps exist, which, however, are gradually being filled by the official reports on holdings which are published from time to time.

A map of the State, showing the approximate area occupied by the metal-bearing rocks, is appended; and also a statement giving the mineral production from 1840 to 1907. This latter can only be regarded as approximate, and is most probably well within the mark.

I have no hesitation in saying that South Australia is exceptionally well endowed with minerals. The full recognition and exploitation of its wealth in this direction is in any case only a matter of time; and that the information gathered in this book may help in the forward movement of our State is my earnest hope.

H. Y. L. BROWN, Government Geologist.

Adelaide, February 24th, 1908.

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* NOTE.—Returns from Government Battery and Cyanide Plants quoted are up to June 30th, 1907.



A Short Account of the Chief Geological Features of the State of South Australia.

In order to elucidate these notes of the principal geological formations of the State of South Australia, a short description of its physical geography is necessary.

A main range extends from Cape Jervis in the S., the opposite point of the mainland to Kangaroo Island, to beyond Hergott Springs in the N.—a distance of about 400 miles—branching from about 150 miles N. of Adelaide to the New South Wales border, in the vicinity of the Barrier Ranges, and from Beltana N.E. to Mount Babbage. This area includes the Mount Lofty, Barossa, Flinders, Mount Nor-West, and Willouran ranges, and also smaller ones. The highest points are Mount Lofty, 2,327ft.; Mount Brown, near Port Augusta, 3,200ft.; St. Mary's Peak, Wilpena, 3,900ft.; and Benbonyathe Hill, near the Illinawortina Pound, 3,476ft.

The Tomkinson, Mann, and Musgrave ranges extend in the N.W. corner from the Western Australian boundary E. for over three degrees of longitude along and S. of the 26th parallel of S. latitude, the N. boundary of the State. The Gawler Ranges run from near Port Augusta W. for about 120 miles. N. of these are the Warburton Ranges, isolated and of comparatively low elevation. Ranges of similar character are the Peake and Denison, W. of Lake Eyre; and there are also detached areas in the vicinity of Port Lincoln and Franklin Harbor, on Eyre Peninsula. The remainder of the State consists of plain and undulating country, with occasional isolated low peaks.

The lakes, mainly large expanses of mud, are numerous and extensive, and occupy low-lying portions of the plain country. The principal ones are Lakes Eyre (N. and S.), Torrens, Gairdner, Frome, and Blanche.

The Murray is the largest river. It enters the E. boundary of the State in latitude 34°, runs E. to Morgan, thence S. to its mouth at Encounter Bay, previously widening out into Lakes Alexandrina and Albert. This is the only navigable river in South Australia. The drainage from the E. watershed of the main range as far N. as the Burra runs into the Murray; from the W. as far N. as Port Augusta into Gulfs St. Vincent and Spencer; further N. the E. drainage is on to plains and into Lake Frome, and the W. into Lake Torrens. N. of latitude 30° drainage from all sides is into Lake Eyre, the principal rivers being the Cooper and Diamantina (entering from Queensland), the Finke (from the Macdonnell Ranges, Northern Territory), the Alberga and the Hamilton (from the Musgrave Ranges), and the Neales and others from the W. From the Musgrave Ranges S. to the Great Australian Bight and the W. coast of Eyre Peninsula there are no lines of drainage of any importance on the surface.

The coastline presents, roughly, a sweep N.W. from Cape Northumberland, in latitude 38° S., to Eucla, latitude 31° 30' S., crossing 12° of longitude (129° to 141°), deeply indented by two gulfs—St. Vincent and Spencer's. Kangaroo Island, immediately S. of St. Vincent Gulf, is the largest island of the State, and there are numerous smaller islands, grouped and separate, in Spencer's Gulf and on the W. coast as far as Fowler's Bay.

From Eucla to the head of the Great Australian Bight the coastline consists of continuous cliffs from 200ft. to 300ft. high, forming the edge of the Nullarbor Plain plateau.

GEOLOGICAL FORMATIONS IN ASCENDING ORDER.

ARCHÆAN (Metalliferous Rocks).—Granite—Gneiss and Crystalline metamorphic, hornblendic, micaceous, and argillaceous rocks are found at several places, but to a limited extent, to underlie rocks containing Cambrian fossils; and in other places there are considerable exposures of granitic and gneissic rock containing granitic dykes of later age which may also be Pre-Cambrian. These constitute the lower rock systems, and may be classed as Archæan. Chief localities: S. portion of Yorke's Peninsula, N.E., N. end of Main Range, Musgrave Range, &c.

PRE-CAMBRIAN AND CAMBRIAN (Metalliferous Rocks).—The Main Ranges from Cape Jervis to Mount Babbage, the ranges at Port Lincoln and Franklin Harbor, Kangaroo Island, the N.E. (Olary Ranges), Mount Nor-West Ranges, the Peake and Denison Ranges (near Lake Eyre), and isolated areas, are composed of highly contorted, faulted, cleaved, jointed, and metamorphosed beds of micaceous, hornblendic, and quartzose schists, sandstones, quartzites, argillites, clayslates, conglomerates, crystalline limestones, and dolomites, intruded into and intersected in places by igneous rocks consisting of granites, diorite, dolerite, gabbro, felspar, porphyry, felsite, &c. The Gawler Ranges are composed of granite and felspar-porphyry, the latter predominating; the Musgrave Ranges of granite, metamorphic and eruptive, and altered sedimentary rocks. Cambrian rocks containing fossils of undoubted Cambrian age have been found in dolomitic limestone beds at Normanville and Sellick's Hill, S. of Adelaide, near Ardrossan, Yorke's Peninsula, near Gordon, Belton, Wirrealpa, Ajax Mine, Mundowdna, and Ediacara in the Far North, and E. of Hawker. These beds occur in connection with those just mentioned, but owing to the intense plication, varying thickness, faulting, and non-persistence of individual beds and metamorphism of the whole series their exact stratigraphic relationship can only be determined by exhaustive geological survey and mapping.

Fossils.

Ethmophyllum hindei
Coscinocyathus tatei
Microdiscus subsagittatus
Ptychoparia australis
Orthisina compta
Platyceras etheridgei
Stenotheca rugosa
Hyalolithes communis

Protopharetra (?) scouleri
Olenellus pritchardi
Dolichometropis tatei
P. howchini
Ambonychia macroptera
Ophileta sublangulata
Salterella planoconvexa
H. conularioides

ORDOVICIAN.—Beds of quartzite, sandstone, grit, shale, and conglomerate, dipping at low angles, and often horizontal, occur on Kangaroo Island, in the neighborhood of Port Augusta, along the W. side of Lake Torrens, and on the Alberga River. No fossils have been found in them; but from the positions they occupy and their resemblance to the Ordovician fossiliferous rocks found S. of the Macdonnell Ranges, they are probably of that age.

MESOZOIC (Jurassic).—Argillaceous, carbonaceous, and bituminous shale, with thin bands of sandstone, limestone, ironstone, pyrites, &c., containing seams of coal.

The best defined outcrop of this formation is at Leigh Creek, where a basin has been proved by boring to have an extreme depth of about 2,000ft. of strata containing Jurassic fossils. In one bore, at from 1,496ft. to 1,544ft., over 47ft. of brown coal was passed through in one continuous bed, and small seams at intervals for 300ft. or 400ft. deeper. Characteristic fossils of the same age have been discovered at Ooroowillannie Swamp, near Kuntha Hill, on Cooper's Creek, and bituminous shale and coal, similar to that of Leigh Creek, at Lake Phillipson and other places in bores put down for artesian water. There is no distinct line of demarcation between this and the overlying Lower Cretaceous formation. It is probable that the sandstone, gravel, and conglomerate in which the artesian water occurs is of Jurassic age.

Fossils.

Alethopteris australis
Oleandridium (?) fluctuans
Thinnfeldia odontopteroides
Unio eyrensis

Macrotaeniopteris winamattæ
Podozamites lanceolatus
T. media

MESOZOIC (Lower Cretaceous).—Gypseous clays, marls, argillaceous shales, and sandstones, with thin bands of limestone, ironstone, pyrites, &c., and sometimes thin seams of brown coal resting on sandstone and gravel conglomerate beds. This formation, with or without the underlying Jurassic beds, fills the vast artesian basin of which Lake Eyre is approximately the centre. From the N.E. corner of the State it is continuous W. along the Queensland border, and to slightly beyond the 134th meridian, and S. along the boundaries of Queensland and New South Wales to latitude 30° S. W. of Lake Eyre its boundary has not yet been determined, but probably does not extend very far in that direction. It is bounded N. and S. by granite and other primary rocks.

The most W. bore, viz., that at Lake Phillipson, has passed through a shale formation down to 3,131ft.

The depth to which bores have been sunk in this area, and artesian water obtained, varies from a few feet, in the vicinity of the outcrops of primary rocks, to 4,850ft. in that portion of the basin extending N. towards the Queensland border.

The following schedule gives particulars concerning some of the principal bores :—

Name of Bore.	Height of Surface above Sea Level.	Depth.	Temperature of Water (F).	Supply of Water per Diem.
	Feet	Feet	Deg.	Gallons
Mungerannie	250	3,370	187	600,000
Kopperamanna	50	3,000	176	890,000
Mitta Mitta	260	3,534	190	470,000
Mt. Gason	250	4,420	204	480,000
Goyder's Lagoon	125	4,850	208	600,000

Characteristic Fossils.

Lingula subovalis
Pseudavicula australis
Maccoyella barklyi
Lima randsi
Mytilus rugocostatus
M. linguloides
Cytherea clarkei
Leda elongata
Natica variabilis
Belemnites australis
Crioceras australe

Pecten socialis
P. anomala
M. corbiensis
Pinna australis
M. inflatus
Nucula quadrata
C. woodwardiana
Mya maccoyi
Cinulia hochstetteri
B. canhami

and others.

MESOZOIC. (?)—Argillaceous and arenaceous shales, grits, sandstones, quartzose sandstone, gravel, and conglomerate, with limestone and concretionary clay ironstone. The deposit, which is horizontal and undulatory, contains scattered pebbles and boulders of granite, quartzite, sandstone, &c. Some of these boulders are of great size, and denudation has led to their being scattered over the surface to a considerable extent. Bores have been sunk through the deposit to ascertain whether it contained coal, as from its general appearance and resemblance to carbonaceous rocks of the Cape Otway district, Victoria, which contain small seams of coal, and are of Mesozoic age, it was thought that this might be the case. It

may be noted that the Cape Otway beds also contain beds of pebble conglomerate, the pebbles consisting of granite, syenite, mica schist, &c. The deposit is undoubtedly a glacial one. The greatest thickness, proved by boring through these beds, was 964ft., at which depth clayslate of Primary age was bottomed on. The rocks passed through in sinking consisted of shale, sandstone, and soft argillaceous sandstone, with occasional bands of hard sandstone, down to 696ft., after which sandstone with boulders (sandstone conglomerates) continued to the bottom. This bore was started on a creek flat, or low ground, and does not, therefore, represent the total thickness, as hilly country composed entirely of this formation rises—particularly in the neighborhood of the watershed between Encounter Bay and Gulf St. Vincent—to a height of several hundred feet. The area occupied by the deposit is considerable. The main body stretches across from Victor Harbor to Yankalilla—a distance of about 20 miles. It is of irregular shape, having a width in places of 5 miles, and lies in a trough between high ranges; its boundaries have not yet been completely defined, and it probably underlies a portion of the Miocene Tertiary lying N. and N.W. of Crozier's Hill and other places in the hundreds of Encounter Bay, Goolwa, and Waitpinga. Between Yankalilla and Second Valley and at Cape Jervis there are beds of clay and boulder drift which may be of similar age; and these may, however, have been reconstructed from them or deposited during Miocene times. On Kangaroo Island, in the hundred of Menzies, there is a similar deposit, which consists of false-bedded horizontal and slightly dipping beds of sandstone and grit, with pebble conglomerate layers on shale, and sandy clay, containing concretionary masses of brown iron ore and ferruginous sandstone with pebbles and overlaid unconformably by basalt; it appears to be an outlying area of the Yankalilla and Encounter Bay beds. No fossils have been found at any of these localities; but from the similarity of these beds to those of the Cape Otway district they may be provisionally classed as Mesozoic.

LOWER TERTIARY OR UPPER CRETACEOUS.—Chiefly in the N.E. portion of the State there are large areas of stony downs and tablehill country where sheets and isolated cappings as thin beds of sandstone, quartzite, conglomerate, jasper rock, porcelained shale, &c., overlie both the Lower Cretaceous and older rock formation, which are of either Lower Tertiary or Upper Cretaceous age. The beds are intermittent in character, and are scattered over an area extending from the end of the Musgrave Ranges E. to the Queensland border, S. to Lakes Frome, Torrens, and Gairdner; and W. towards the Western Australian border, in which direction they occur as small and widely separated exposures.

Principal Fossils.

Mantellia babbagensis

Zamites ensiformis

EOCENE.—Polyzoal coral and shell limestone, chalky limestone with flints, fossiliferous clays, calcareous sandstone and shale.

Localities.—On the Murray River, from Bookmark downward to Murray Bridge, good sections of these rocks overlaid by Miocene strata are exposed. The Nullarbor Plain, extending from Eucla to Denial Bay, and forming sea cliffs from 200ft. to 300ft. high, between the head of the Great Australian Bight and the Western Australian border. The coasts of Yorke's Peninsula, Ports Willunga and Noarlunga, Kangaroo Island, and other places to a less extent.

Localities Inland.—Near Ardrossan, McLaren Vale, Mount Jagged. At these places the beds are elevated to a height varying approximately from 200ft. to 700ft. above sea level. On the Adelaide plains a bore at Croydon showed a thickness of at least 2,296ft.

The deepest bore sunk for water on the Nullarbor Plain penetrated a thickness of 500ft. of crystalline limestone and white chalky limestone with flints, succeeded by shale gravel, &c., to 1,387ft., where it bottomed on granite.

Characteristic Fossils.

Magellania insolita	M. pectoralis
Magasella deformis	Salenia tertiaria
Scutellina patella	Cassidulus longianus
Lovenia forbesi	Fibularia gregata
Oxyrhina woodsii	Aturia australis
Voluta pagodoides	Fusus sculptilis
Turritella aldingæ	Natica aldingensis
Dentalium mantelli	Dimya dissimilis
Lima bassii	Pecten consobrinus
Pecten aldingensis	P. eyrei
P. flindersi	P. hochstetteri
Glycimeris cainozoica	Limopsis insolita

Chione cainozoica

MIOCENE.—Sand, clay, shale, loam, shell limestone, limestone, sandstone grit, conglomerate, gravel, and boulders. These deposits fill the basins of ancient estuaries and old river beds, rising in the ranges and trending towards and into the sea, forming low cliffs along the coast and in its vicinity, and probably underlying newer formations at numerous places along the coast.

The oyster beds of the Murray Cliffs, Willunga, &c., are of this age.

Characteristic Fossils.

Terebra crassa	Ancillaria orycta
Latirus approximans	Marginella hordeacea
Murex anceps	Cominella subfilicea
Campanile triseriale	Semicassis subgranosa
Calyptrea crassa	Diastoma provisi
Heligmope dennanti	Natica subvarians
Ostrea sturtiana	Ostrea arenicola
Spondylus arenicola	Placunanomia ione
Pecten antiaustralis	Lima jeffreysiana
P. palmipes	P. consobrinus
Lima semicostata	Amussium lucens
Lithodomus brevis	Mitylus submenkeanus
Cucullæa corioensis	Barbatia simulans
Cardita dennanti	Trigonia acuticostata
Meretrix sphericula	Cardium mediusulcatum
Corbula ephamilla	Dosinia grayii
Lucina nuciformis	Panopæa orbita
Tellina lata	Loripes simulans
Myadora corrugata	T. basedowi
Plesiastræa st. vincenti	Macropneustes decipiens

VOLCANIC ROCKS.—Basalt, dolerite, amygdaloid, lava, ash, &c., which have been derived from several points of eruption, cover limited areas in the South-Eastern district in the vicinity of Mount Gambier and Millicent, and smaller areas in the hundred of Menzies, Kangaroo Island. Mount Gambier itself is composed of volcanic ash beds, which at one time formed a portion of the walls of a crater. Mount Schank is a perfect crater, formed of beds of ash, scoria, &c. Other eruptive centres occur in the neighborhood of Millicent. The basalt overlies beds of coralline limestone with flints of Tertiary age. The volcanic eruptions most probably took place at the same time as those in Victoria, where the basalt flows overlie Pliocene gold drifts. The Kangaroo Island basalt occurs as cappings in the hundred of Menzies; it rests on a slate formation similar to that of Yankalilla

and Encounter Bay, the age of which has not yet been determined. Its thickness is about 100ft., and its geological age is most probably the same as that of Mount Gambier.

POST TERTIARY (Pleistocene).—Sand, loam, concretionary limestone, clay, gravel, marl, gypsum, salt, shell limestone, sandstone, limestone, conglomerate, gravel, and boulder drift; these constitute the surface formations over a large extent of the plain country and the alluvium of the creeks and gullies running through and from the ranges into these plains, and as cappings to all rocks of greater age. Alluvial gold occurs in these deposits in many parts of the State, and has been worked for to a greater or less extent on the various goldfields which have been discovered in the main range from Cape Jervis N., and on the isolated ranges W. of Lake Eyre.

Fossil remains of large extinct mammals (marsupial), birds, reptiles, amphibians, and fishes have been found. These include—

Marsupials.

Diprotodon
Nototherium
Phascolomys
Sarcophilus

Palorchestes
Macropus
Thylacoleo

Aves.

Genyornis (Newtoni)

Phalacrocorax

Reptilia.—Crocodylia: *Pallimnarchus Polleus*, larger than any living species, a freshwater species allied to *C. Johnstoni*, but larger. *Chelonia* (tortoise): *Megalania Prisca*, a gigantic land lizard. Localities: Warburton River, Cooper's Creek in vicinity of Lake Eyre.

Pisces.—*Ceratodus Silurard* and other fishes. Localities as above.

The chief localities of the mammals are Adelaide, Yankalilla, Millicent, Baldina, Bunday, Mundowdna, Booleroo Springs, Lake Callabonna, Warburton River, and Cooper's Creek.

At Yankalilla and other places the remains of diprotodon, &c., occur in soft spring deposits. At Lake Callabonna they are partially imbedded in the mud of the lake, in which they appear not to have been disturbed since their original deposition, and in other localities they occur in alluvium, either *in situ* or washed out by floods.

Ice Action is evidenced by glacial striæ on rocks of presumably Cambrian age, and on erratic boulders at Hallett's Cove, and in the Inman River, and also by the occurrence of erratic boulders in the same district and on Yorke's Peninsula, Kangaroo Island, &c. There is no fossil evidence, but the deposit at Hallett's Cove underlies Miocene limestone, and may provisionally be regarded as of Mesozoic age.

Erratic boulders are found strewn on the surface and imbedded in the Lower Cretaceous shales of the Central Artesian basin.

Pebbles and boulders occur in conglomerates of the Mount Lofty, Flinders, and other ranges; some of these are striated and considered to indicate deposition by means of ice action in the Cambrian period. Doubt has recently been thrown on these conclusions in the case of some conglomerates of the Mount Lofty Range, and it is still a matter of controversy amongst geologists whether these phenomena are of glacial origin or due, wholly or in part, to earth movements and fluvial action.

The chief geological formations are here briefly sketched, and, in conclusion, as derived from the metal-bearing strata, some condensed notes concerning the mineral resources of the State, which will be of general interest, are appended.

What is believed to have been the first authentic discovery of gold in Australia, to which public attention was called, and from which actual mining operations resulted, was made in January, 1846, about 10 miles E. from the city of Adelaide; but although the precious metal has been found at many places over large areas, yet as a gold-producer South Australia ranks last of the States of the Commonwealth. The principal auriferous districts are in the main range from its S. portion through Echunga, Talunga, Barossa, and Ulooloo to Wonna, about 140 miles N. from the city; thence N.E., Mount Grainger, Waukaringa, Mannahill, Wadnaminga, and Olary districts. The best find of alluvial gold yet made was in the saltbush and low hills country of Teetulpa, about 200 miles N.E. by N. of Adelaide; this was discovered in October, 1886. The area was small, and the ground was soon worked out, but it is estimated that about £300,000 worth of gold has been obtained from an area not exceeding one square mile. An immense district of similar country surrounds this place, and much desultory prospecting has been done, but so far Teetulpa remains the solitary rich patch unearthed here. Rich gold reefs have been discovered at Tarcoola, about 300 miles N.W. from Port Augusta. Gold has also been found in the Peake and Denison ranges, and near Yudnamutana, in the N. portion of the main range.

To compensate for the lack of gold, South Australia is the chief copper-producer of the group. The Burra Burra Mine, about 100 miles N. of Adelaide, has yielded nearly £5,000,000 worth of copper. The Wallaroo and Moonta Mines on Yorke's Peninsula have extracted up to date copper valued at about £12,500,000. The Kapunda Mine, which is the oldest copper mine in the State, having been discovered in 1842, situated 50 miles N. of Adelaide, has also produced a large quantity of very high-class copper. Throughout a large portion of the State more or less copper is found, and in the N. portion of the main range and the adjacent country a large number of copper mines and prospects are being worked.

Silver-lead mines exist in the main range S. of Adelaide. The Wheal Gawler Mine, near Glen Osmond, was originally opened in May, 1841, and is probably the first mine worked in Australia. Deposits of silver-lead exist also in the N., E. from Farina and W. from Beltana.

Large deposits of iron are numerous, the principal one being the Iron Knob, situated about 40 miles W.S.W. from Port Augusta. Here a vast quantity, estimated at 21,000,000 tons, of high-grade (66 per cent.) iron ore and manganic iron is in sight. It is connected by a railway with False Bay, on Spencer's Gulf, and the ore is used at present as flux in the Broken Hill Proprietary's works at Port Pirie. The magnitude and importance of this deposit are, so far, not equalled in Australasia. Large deposits of phosphate rock, containing as high as 81 per cent. tricalcic phosphate, have been found for a distance of 200 miles along the main range—from Mount Magnificent in the S. to Carrieton in the N.—and at Clinton, on Yorke's Peninsula. The principal localities are Belvidere and St. John's, near Kapunda; hundred Bright, near Burra; hundred Bendleby, near Carrieton in the N.; Clinton and hundred Cunningham, Yorke's Peninsula; and Mount Magnificent and near Noarlunga in the S.

Respecting the rare minerals, a discovery of Uranium (carnotite) and Vanadium ore has been made in the Olary district, but it has not, so far, proved of economic value. Vanadium ores are also found in other localities. Monazite in small quantity has also been recently discovered.

H. Y. L. BROWN, Government Geologist.

EARLY HISTORY OF SOUTH AUSTRALIAN MINES.

The first compilation which can be regarded as an authentic history of mining operations in South Australia is contained in the *Royal South Australian Almanack for 1848*, published by John Stephens, Hindley Street, Adelaide.

The editor in his preface says, "Altogether the *Almanack* for 1848 will form a compendious history of the present condition of South Australia; and as the information communicated has been collected from authentic sources, where such was practicable, it may safely be relied upon as substantially correct."

The section is headed "Mines and Mining Companies in South Australia." It has evidently been prepared with much care, and is written in a general spirit of breezy optimism which, although refreshingly cheerful, argues in some respects a certain lack of expert knowledge on the part of the compiler. It is very interesting, not only from the actual mining information it gives, but also from the association of the honored names of the first enterprising mining adventurers of South Australia.

Regarding the various mines noted, the sanguine expectations entertained were, in some cases, more than realised; in others they turned out failures, and in others again the ground still remains undeveloped.

The old record is here republished in full (except the forms of share certificate), and the later information concerning the various mines will be found in proper order throughout the book.

MINES AND MINING COMPANIES IN SOUTH AUSTRALIA.

[Extracted from the *Royal South Australian Almanack for 1848*.]

The first metalliferous mineral which attracted notice in South Australia was its iron, the ores of which are exceedingly abundant, and exhibit specimens of great beauty and variety, with occasional masses of almost incredible bulk. Malleable iron may be produced without smelting from some of the ores with extraordinary facility; and for the purposes of the founder, other kinds have been proved easily susceptible of the smelting process, yielding a large proportion of fine-grained and compact metal, from ore put into the blast furnace without any roasting or preparation other than being broken into moderate-sized pieces. Nevertheless, nothing beyond experimental attempt was undertaken in iron until the last year, when smelting operations were commenced with some of the produce of a large lode, or rather mountain mass, of excellent iron ore, situate in the midst of the stringybark forest, about 12 miles from Adelaide, which furnishes suitable fuel in abundance. The attempt is yet in its infancy; but manifest grounds for encouragement are said to exist.

The mineral substance which first of all attracted *practical* attention was the argentiferous galena on land now comprised in Wheal Gawler Silver-lead Mine, some of which substance "cropping" through the surface was crushed by dray wheels passing over it, and then became obvious from its metallic brilliancy.

At length the valuable copper treasures of "Montacute," "Kapunda," and the renowned "Burra Burra" were successively brought under the notice of scientific and practical men, the first-mentioned being vertically exposed and otherwise extensively apparent in the almost perpendicular rocky declivities of a mountainous position; the second plainly indicated by a plentiful surface sprinkling of blue and green carbonates and other rich varieties of copper ore; and the "Monster Mine" (as the Burra Burra was first called) attracting the notice of a shepherd by its massive "out-croppings" and the rich mineral variety on the surface, which, even to uninitiated persons, vouched at first examination for immense undeveloped treasures below.

Discoveries more or less fruitful have followed upon each other since the great value of the colonial mines became so manifest from extremely successful operations, more especially at Kapunda and the Burra Burra, until a number of undertakings have been brought into active prosecution. These we shall describe, as they come under notice, in alphabetical arrangement, limiting our observations in the way of commendation to such practical data and undoubted assurances as afford the proper grounds of judgment in regard to prospective properties, and those which are already largely productive.

THE ADELAIDE MINING COMPANY (COPPER).—The Adelaide Mining Company, was formed in 1846, chiefly with a view to copper mining, and the shareholders' very sanguine expectations are likely to be fully realised.

Seven directors, whose minimum of qualification is £100, or twenty scrip receipts of £5 each, are operating under a deed of settlement, the paid up capital being £10,000.

The quantity of copper ore raised may be set down at about 200 tons.

The property of this company is distant about 10 miles from Adelaide. The sales are usually effected at the Port. The prospects of this company have greatly improved of late upon their sections 5528 and 5226 (near the Montacute Mine). In the latter is a lode 30ft. wide, containing a variety of copper ores and a vein of red oxide similar to that of the Burra Burra. The company is governed in conformity with a deed of settlement.

THE AUSTRALIAN MINING COMPANY.—The Australian Mining Company is an association of London capitalists, the subscribed capital being £400,000 in 20,000 shares of £20 each, upon which £40,000 has been paid up. The following gentlemen compose the London board of directors:—W. T. Copeland, Esq., Alderman and M.P., 37, Lincolns Inn Fields; Samuel James Capper, Esq., 1, Adelaide Place, London Bridge; H. De Castro, Esq., 19, South Street, Finsbury Square; H. J. Enthoven, Esq., 8, Moorgate Street; Edward Hagen, Esq., Mill Street, Bermondsey; B. E. Lindo, Esq., 3, Winchester Buildings, Great Winchester Street; John Masterman, jun., Esq., Nicholas Lane, Lombard Street; J. B. Montefiore, Esq., 2, Winchester Buildings, Great Winchester Street. The trustees are—John Capper, Esq., 1, Adelaide Place; Benjamin Greene, Esq., 45, Russell Square; Frederic Mildred, Esq., 35, Nicholas Lane. Auditors—Henry Buckle, Esq., 33, Mark Lane; George Burnard, Esq., 12, Cornhill; George Palmer, jun., Esq., 11, King's Arms Yard, Coleman Street. Bankers—Messrs. Masterman, Peters, and Co. Solicitor—Thomas Hanson Peile, Esq. Secretary—George Edmund Hodgkinson, Esq.

This company is conducted under a deed of settlement, and is represented in the colony by four local directors, namely, George Alexander Anstey, Esq., John Baker, Esq., Jacob Hagen, Esq., John Hart, Esq., who selected for their London constituents their special survey of 20,000 acres (paid for in London) at Reedy Creek, 34 miles from Adelaide, in a north-easterly direction, and are there employing a considerable number of men in raising copper ore and in preparatory operations, which not only afford every prospect of success but are already largely productive, although not yet to the extent anticipated after a careful examination of the company's property by competent persons.

Mr. Alfred Phillips, who is the chief captain, is resident at the mines ; and from the liberal views entertained by the London company there is no doubt that their principal property, "Tungkillo," will soon be occupied by a large and industrious population, having their physical and moral wants provided for, and capable of remunerating a generous proprietary.

The company's property is productive of emery as well as several varieties of copper ore. One hundred tons of emery were carried down for shipment in December last.

Nine choice mineral sections in the neighborhood of the Kapunda Mine, and comprising above 700 acres, have since been secured by purchase at a Government land sale, and there is every reason to believe these purchases will prove highly fortunate.

The second annual general meeting of the Australian Mining Company was held at their offices, London Bridge, on Monday, the 26th July last. In the absence of S. J. Capper from severe illness, E. Hagen, Esq., occupied the chair. A numerous body of proprietary attended. After attending to the body of miners sent to the colony in the *Rajah*—being portion of 580 adult emigrants sent out under virtue of the company's land grant—the report expresses the desire of the directors for the moral and spiritual welfare of these persons and their families in the following terms :—"Availing themselves of the chairman's acquaintance with the Bishop (Dr. Short), the board entered into communication with His Lordship, with the view of providing moral and spiritual instruction to the operatives in the company's employment. For the promotion of that object, a glebe of 50 acres of the company's land, at the special survey, has been granted as a site for a church, clergyman's residence, and a school or schools ; and the directors have great pleasure in stating their fullest expectation that the Tungkillo Mines will be made the permanent residence of a clergyman and a head missionary station. This point appears to the directors to be one of no small importance, not only as consolidating a settlement of the company's operatives, but as founding a township which is likely to be productive of much benefit in the inducement it affords to strangers to establish themselves and follow agricultural pursuits on the company's property. The directors did not feel at liberty, without consulting the shareholders, to grant any endowment from the company's funds ; but *they have all promptly forwarded the object by assisting the subscription in their individual capacity.*

On the day of meeting three directors went out of office by rotation. The lot fell upon Samuel James Capper, Edward Hagen, and John Masterman, jun., esquires, and those gentlemen, being immediately eligible for re-election, offered themselves, and were accepted accordingly.

The reason assigned at the meeting for the discontinuance of operations upon the purchased sections was that the local board, finding that the lode was situated on the borders of the section, had prudently and cautiously determined to suspend operations until an opportunity offered of purchasing the adjoining land at a reasonable price rather than to excite the competition of speculators, which would be the case if the quality and value of the lode was more generally known.

THE BON ACCORD MINING COMPANY.—The Bon Accord Mining Company commenced in April, 1846, with the purchase of a block of 347 acres, immediately adjoining the Burra Burra property on the north. The operations of this company were not immediately productive, like those of the neighboring proprietary, although by no means such as to afford serious grounds of discouragement. Nevertheless, the working has been temporarily suspended, awaiting the determination of the proprietors, who reside in New South Wales or parts more distant.

The proprietors have been successively represented by Mr. Moorhead and Mr. Belcher. Latterly Captain Ey (a German), who first superintended the successful operations at the Burra Burra, has been engaged at the Bon Accord Mine ; and good fortune having again attended his work of exploration, a productive and highly promising lode of copper ore is being operated upon.

THE BURRA BURRA COPPER MINE, or the SOUTH AUSTRALIAN MINING ASSOCIATION.—The principal operations of this association commenced in September, 1845. The fact of the discovery of masses of copper ore cropping out of the surface in a remote district having been divulged to certain colonists, those gentlemen communicated the circumstances to their friends, and preparations were made for securing through the only means open to adoption, namely, by special survey of 20,000 acres, the land containing the obvious treasure. Eventually two distinct parties joined for the express purpose of making the £20,000 purchase, which, being effected, the two parties, after the surveyed land had been lineally divided into two portions, met to appropriate them, and the northern moiety of the 20,000 acres conjointly secured fell to the lot of the association, which claims especial notice. The subscribed capital being fixed at £12,320, it was determined to issue proportionally to the subscribers transferable scrip representing 2,464 shares of £5 each, which were at first deemed the only necessary proofs of proprietorship or voting credentials; but the association has now a regular deed of settlement.

The management is vested in a board of nine directors, whose qualifications were originally the possession of 40 £5 scrip, but subsequently reduced to 20.

The following gentlemen compose the present direction:—Chairman, Chas. Beck, Esq.; directors, Messrs. J. B. Graham, J. Ellis, J. Brown, John Waterhouse, Wm. Paxton, William Allen, Samuel Stocks, William Peacock; secretary, Mr. Henry Ayers; auditors, Messrs. Frederic Wicksteed and George Tinline. The following are the officers resident at the mines:—General superintendent, Thomas Burr, Esq.; chief captain, Mr. H. Roach; second captain, Mr. M. Bryant; accountant, Mr. E. Barry; clerk, Mr. W. Challoner; storekeeper, Mr. Humber.

The association had no sooner broken ground at the Burra Burra, distant in a direct line 86 miles from Adelaide, and about 96 by road, than their operations became productive; and so favorable was the intervening country that the conveyance of ores to the Port immediately followed, and is being prosecuted uninterruptedly through the dry months of the year, and to a considerable extent even in winter.

The price of shares has long maintained an upward tendency, until the £5 share has become saleable at £160 and upward for cash payment.

The first cargo to Swansea direct per *Amelia* was found by assay to yield only 20 per cent. to 22 per cent. This arrival, however, had been preceded by 55 tons received from London, *ex Gunga*, of which 25 tons yielded an average of 40½ per cent., and was sold at £30 11s. per ton; and 30 tons, which yielded only 14½ per cent., were sold at £10 16s. per ton.

These returns were sufficiently encouraging, and the shipments have gone on until they have amounted to the aggregate hereinafter referred to, the last sales having produced highly remunerative returns, averaging £25 4s. per ton. On the 19th of October last the directors published their fourth half-yearly report, by which it appears the total quantity of ore raised during the two years of operations was 17,105 tons, of which the quantity shipped or sold in the colony was 8,845 tons (nearly), and the quantity at the mine ready for removal about 7,092 tons. The quantity of land purchased by the association is 10,640 acres.

The outlay of the association under the head of "improvements" and otherwise has comprised a number of substantial dwelling-houses in their contiguous township of Kooringa, as well as the residences, offices, smelting-house, and other permanent or temporary erections at the mine. The following returns declare the respective numbers employed or resident in the township, or in and about the Burra Burra:—Men, 480; women, 140; children, 320—total, 940.

Besides these there are sawyers, charcoal burners, carters, and others, to the number of 50 or more, employed at various distances from the mines: so that the population of the association's district is not less than 1,000 souls.

It is difficult to use adequate terms in describing the Burra Burra property without incurring (from strangers at least) the charge or suspicion of improper motive; but the least we can say is that for intrinsic value the Burra Burra will bear comparison with the choicest property of a similar kind in the British Empire. An opinion precisely like that contained in the foregoing paragraph was enunciated in this periodical before any dividend was declared; and as during the last six months of 1847 dividends to the amount of *four hundred per cent. upon the capital* were paid to the shareholders, and the year has closed amidst new evidences of unexampled prospective advantages—in improved sales of the copper ores at Swansea, and vast developments at the mines—it is not too much to assert that in the territorial wealth of the Burra Burra alone South Australia includes a mineral property worth *half a million sterling*.

CURRENCY CREEK MINE is yet in its infancy, some works of exploration only having been as yet attempted; although a further examination lately instituted by Mr. James Allen, on behalf of the chief proprietors in London, will, it is supposed, superinduce the commencement of systematic operations. The copper lode intersects the township land of a special survey which has been appropriated to the respective proprietors, so that they must reunite in order to a joint prosecution of the mine.

The present committee in London are Messrs. Hananel DeCastro, F. Friend, R. T. C. Gray, T. R. Thompson, C. Roberts, R. A. Hussey, and Stephen White.

Mr. Finke, more than a year ago, reported most favorably of the mineral capabilities of the Currency Creek property, which he had recently examined; and the specimens of blue and green carbonate found there, and exhibited on his return to Adelaide, created much sensation at the time.

MR. DUTTON'S MINE.—Mr. Dutton's Mine—so-called—is an obvious deposit of copper ores on a block of 631 acres, purchased by that gentleman for himself and others, and situate adjoining the Princess Royal Mine on the south. No operations of any consequence have been undertaken upon this property; but there is no doubt of its soon being extensively prosecuted, as means have been taken to introduce the requisite capital and labor. The distance of this property from Adelaide is 82 miles.

THE ENTERPRISE MINING COMPANY (COPPER AND LEAD).—Capital £3,000 in 1,000 shares of £3 each, £1 per share deposited.

The chairman of this company is Anthony Forster, Esq., and the following citizens constitute, with him, the board of directors, viz.:—Messrs. Edgecombe, Abbott, Phillips, LaVence, Suter, and Gurr. The trustees are Messrs. James Phillips, Edwin Bennett, Wm. Edgecombe, and William Phillips. Secretary—Mr. John W. F. Dalton. Auditors—Messrs. John Bradford and Thomas Onslow.

The operations of this company have hitherto been conducted upon lands held under lease; but the rules permit the purchase of mineral lands as well as the taking leases of other lands. The following sections comprise the leaseholds hitherto operated upon by the Enterprise Company:—Section 5535, on the Sixth Creek; section 5607, on the Torrens; section 267, adjoining Wheal Gawler Silver-lead Mine. On the first, various specimens of copper ore have been found, including the following varieties:—Red oxide, containing specks of virgin copper; grey copper, black oxide, and occasionally traces of blue and green carbonate.

The company commenced in the spring of 1847; and as the sum originally subscribed has not hitherto produced any profitable return, the second call of £1 per share was called for and made payable during January of the present year; but the leading shareholders are sanguine of ultimate success; and the vicinity of valuable mineral properties, as well as the indications of subsoil wealth found on their own leaseholds, strongly uphold their expectations.

THE GREENOCK CREEK MINE (COPPER).—The Greenock Creek Company commenced operations in June, 1846, on 160 acres of land, in which good copper ores had been found, the distance from Adelaide being 34 miles.

The paid-up capital, £1,000, is in 200 shares of £5 each. The five following gentlemen compose the directorship, namely, Messrs. Collier, Todd, Smith, Wickes, and Randall—possession of shares to the amount of £50 being the qualification.

Judging from the subsoil discoveries made and copper ore produced, the operations of this company are likely to be crowned with success; and this impression was never stronger than at the period in which we write.

THE GLEN OSMOND UNION MINING COMPANY (SILVER-LEAD).—This company was formed in London, with a capital of £30,000, in 3,000 shares of £10 each, paid in full. The directors have power to increase the capital to £50,000 by issue of 2,000 additional shares of £10 each.

Directors—George Clive, Esq., M.P., William Cubitt, Esq., James John Cummins, Esq. (chairman), Peter Davey, Esq., John Gore, Esq., George Marshall, Esq. **Bankers**—Messrs. Robarts, Curtis, & Co. **Solicitors**—Messrs. Wilde, Rees, Humphrey, & Wilde. **Secretary**—Frederick H. Gore, Esq. **Auditor**—Edward English, Esq. **General Superintendent in the Colony**—Lewis Gilles, Esq. **Local Committee of Management**—Messrs. Wm. Younghusband, Lewis W. Gilles, John Hector.

This company commenced operations on preliminary section No. 295 of 134 acres, situated three miles east of Adelaide, early in December, 1864, with 10 men and a mining captain (Pascoe), and have been increasing the number gradually as the works progressed up to its present force, upwards of 50. Thirteen lodes have been discovered on the section; but, after a few weeks spent in proving, the operations were confined for the time being to three parallel lodes about equi-distant and occupying the north and south extremities of the section. The north lode, called "Gore's," the south "O.G.," and the centre "Victoria," have all yielded satisfactorily.

Several adits and other levels have been driven, cross-cuts made, winzes and four shafts from the surface sunk upon a systematic plan calculated to develop the mine. The works under the direction of Captain Pascoe have been skilfully and economically executed. The produce of ore is more than was calculated upon in so short a space of time, the obtaining it having been made altogether a subordinate consideration to that of constructing the mine upon scientific principles.

One hundred and sixty tons (including lords' dues) have been shipped during the last eight months, and ores ground equivalent to a produce of 300 tons is in course of being taken down. A considerable extent of useful buildings for work-shops, &c., and two blocks of miners' cottages (yielding a fair rental) have also been completed within the year, whilst the proximity of the mine to Adelaide secures the advantage of a low rate of cartage (7s. per ton), and the freight has not exceeded 50s. per ton free in London. So that upon the whole this mine may claim to be considered a prosperous concern; but it is not the intention of the company to confine their operations to Glen Osmond alone, notwithstanding the success which has attended them.

THE KANMANTOO MINE (COPPER).—The Kanmantoo Mines of the South Australian Company, at a distance of 30 miles from Adelaide, are being wrought upon a choice portion of 12,000 acres, part of a special survey taken by the company in conjunction with the Paringa Mining Company in the district of Mount Barker.

These mines have produced, since the period of commencement, December 1845, several hundred tons of good copper ore, some samples having yielded from 40 per cent. to 50 per cent. of metal. The latest reports from experienced visitors to these mines are in the highest degree favorable to the interests of the South Australian Company, which are represented by the company's colonial manager, William Giles, Esq. The chief superintendent of the mines is Captain Rodda; the underground captain Mr. Samuel Doney. The operative force is 65 men and boys.

The preparatory operations having been more considerable than at first expected, it is quite gratifying to observe that the shipments actually effected during the first year amounted to more than 300 tons.

Four hundred tons have lately been shipped per *Competitor* and *Antilla*; and one lode, known at the mines as the "Kangaroo lode," is yielding 100 tons per month, nearly the whole being raised upon "tutwork."

Descriptions of six valuable mineral localities have been sent by the colonial manager to the directors in London, with a view to their being leased to mining companies there. One of the properties described has been already let satisfactorily; a second was about to be let at the period of the last advices; and the other four are, without doubt, destined soon to be operated on with British capital.

Messrs. Thomas Brothers, who have had several years' experience as smelters in Chili, having lately arrived in the colony, have taken a piece of land near this mine, and are erecting smelting works for the purpose of reducing the ores to a regulus. They express great confidence as to the success of their smelting operations, and say that in the course of a year or two smelting furnaces will be as numerous in the colony as flourmills. They further affirm that the colonial wood, in its natural state, will serve all necessary purposes for smelting. Should these expectations be realised, the advantages to the colony will be immense, as there are thousands of tons of ores of inferior quality at the various mines which can only become of any present value by being smelted. To the Burra Burra and Kapunda Mines such a desideratum would be of the utmost importance, and we heartily wish our newly arrived and enterprising fellow-colonists every possible success in their valuable undertaking. Some of the ore sent home from this mine has averaged only between £13 and £14 per ton in the English market; but this, it is said, is to be attributed to improper conduct on the part of the miners, who, at an early period of the workings, were engaged to raise ore at so much per ton.

THE KAPUNDA MINE (COPPER).—The Kapunda Copper Mine was opened in January, 1843, at a distance of 44 miles from Adelaide, and is now the conjoint private property of Captain C. H. Bagot and family and Messrs. Cockrell & Co., London. The quantity of land comprised is 440 acres, but the workings have been chiefly upon a section of 80 acres—the quantity of ore raised having exceeded 2,800 tons, of which 1,800 tons have been shipped, and 1,000 tons were ready for removal at the mine at the date of the compilation of these notices.

The horse-whim machinery having been found insufficient to keep the water under, a steam engine has been imported from England.

The ore shipped from this mine in 1846 amounted to 1,386 tons and some odd hundredweights; and during the present year, notwithstanding the want of steam-power, the shipments have been considerable; some of them have averaged above £20 per ton in Swansea.

THE MOUNT REMARKABLE MINE (COPPER).—The Mount Remarkable Mining Company's chief property consists of a special survey of 20,000 acres in the district above named, distant, lineally, about 150 miles from Adelaide. Sulphuret of copper abounds in this property, and specimens of the richer kinds of ore have been found in it profusely enough; but, hitherto, no productive lodes or very rich masses have been discovered.

Although so distant from the capital and the metropolitan part of the province, the Mount Remarkable district is endowed with great natural facilities. Three good harbors in its vicinity have been examined, and the one at the head of Spencer's Gulf is pronounced capacious, deep, and secure. The lands comprised in the company's 20,000 acres are said to be very valuable, irrespective of these mineral treasures, which, perhaps, it will require a little time to develop.

The company's affairs are managed in conformity with a deed of settlement, which is being prepared by seven directors, the qualification being the possession of ten shares of £20 each.

The present directors are Messrs. F. H. Dutton, A. L. Elder, J. B. Hughes, Philip Levi, E. L. Montefiore, J. B. Neales, George Hall, John Grainger, jun., and William Younghusband, jun.

Since Mr. Finke undertook the work of exploration upon this valuable property, most important discoveries in copper, lead, and slate have encouraged his toil, and are likely to reward handsomely the spirit of the proprietors.

Besides the discoveries made by Mr. Finke, Mr. Inspector Tolmer, of the mounted police, is reported to have made a discovery of emery, which has been used by an experienced colonist and declared fit for the lapidary or any other uses to which the mineral is applied; but another equally skilful gentleman (an optician) pronounced it worthless. The company, however, have shipped 60 tons to England. Every day's experience, indeed, serves to confirm the impression which first led to a demand of this special survey.

THE MONTACUTE MINE (COPPER).—The Montacute Company's property is situate in a part of the Mount Lofty Ranges, at the distance of 10 lineal miles from Adelaide, with which and the Port it has been brought into connection by a road formed through the hill country in continuation of the natural road from town. This company is managed by five directors, namely, Messrs. Arthur Hardy, John Baker, Jacob Hagen, John Hart, and F. H. Dutton; and has secured 640 acres of choice mineral lands, and is operating with a paid up capital of £5,000, represented by 50 scrip receipts for £100 each.

The number of men employed is about 20; the quantity of ore raised about 1,500 tons; the quantity shipped, 1,000 tons; the highest price realised in Swansea, about £18 per ton. The Customs returns of ores exported in 1846 give 503 tons from the Montacute Company's mines.

Since the unfortunate death of Captain Jury, who entertained a high opinion of this mine, and did much to justify his good opinion by a considerable amount of valuable production, the operations have been limited to works of exploration.

The mine is now leased to the Australian Mining Company for three years at one-tenth, and the lessees have commenced operations upon an extensive scale, with every prospect of success.

NORTH KAPUNDA MINING COMPANY (COPPER).—This company was formed in July, 1846, for the purpose of securing, by purchase at the Government land sale, certain sections surrounding the celebrated Kapunda Mine, and reported to be rich in minerals.

The paid up capital is £21,800 in 436 shares of £50 each, and the following gentlemen constitute the board of directors:—Geo. A. Anstey, Matthew Smith, Henry Collier, John Baker, William Blyth, John Hart, George Morphett, P. J. Todd, James Bunce, Chas. Beck, and S. Stocks.

The company possesses 12 sections, situate at an average distance of 44 miles from Adelaide, and has been operating upon the said lands with about 30 miners under the resident superintendence of Mr. J. B. Hack. The operations have not yet been successful, and the services of a resident manager since dispensed with; but those who recommended the purchase of the lands, and others who have subsequently inspected them, declare that ample success must result from a proper perseverance. The company's property has not yet taken its place among the largely productive mineral estates of the colony.

THE PARINGA MINING COMPANY (COPPER).—The Paringa Mining Company commenced its operations in December, 1845, upon a promising portion of 8,000 acres bought at £8,000, being part of a special survey of 20,000 acres taken in conjunction with the South Australian Company. This valuable property is in the district of Mount Barker, at a distance of 25 miles from Adelaide.

The following gentlemen are directors of the Paringa Mining Company:—Messrs. Anstey, John Baker, Collier, Hart, D. Macfarlane, L. Macfarlane, J. Hagen, E. L. Montefiore, and A. Hardy; and are operating with a paid-up capital of £10,000, which is subdivided into 8,000 shares of £1 5s. each.

The quantity shipped during the past year was about 500 tons, being a mere earnest of future achievements.

The principal novelty in the proceedings of the Paringa Mining Company, since our publication of the foregoing report, has been the discovery of a valuable lode of black carbonate of lead, in addition to the copper lode they have been operating upon. The lead lode is rich in silver, and promises to become a most important feature in the varied productive properties of the estate.

THE POONAWURTA MINE (COPPER).—The Poonawurta Company's Copper Mine is comprised within a square mile (640 acres) of land situate at a distance of 42 miles from Adelaide.

This company was established in August, 1848. The paid up capital of £5,000 was subscribed in 1,000 shares of £5 each, for which scrip was issued.

The original directors of the Poonawurta Company were Messrs. Collier, Todd, Smith, Evans, Paxton, Randall, and Wickes.

This company purchased their land under good advice, but their operations were not successful; and after a considerable sum had been expended upon the property without any decisive results, it was determined to bring it to the hammer. Henry Collier, Esq., was the purchaser at £1,000.

PARA MINE.—This is a new adventure, of which report speaks very favorably. It is within 20 miles of Adelaide, and from the surface and subsoil specimens sent in there is reason to believe it will be a productive and valuable mine. Extreme caution marks the proceedings of the Para Mine proprietors, although their property evidently possesses and displays inducements sufficient to justify a considerable outlay.

PRINCESS ROYAL MINE (COPPER).—The Princess Royal Mining Company possess the southern moiety of the special survey of 20,000 acres, taken in conjunction with the South Australian Mining Association (the northern moiety of which contains, as we have already stated, the celebrated Burra Burra Mine). The portion of land hitherto operated upon is productive of copper ores in considerable variety, and gives undoubted promise of vast quantity. It is distant from Adelaide 83 miles, and the natural road has had very little adaption from the hands of man to render it as practicable as that from the Burra Burra.

The capital is fixed at £20,000 in 400 shares of £50 each; and, at the date of the last report (October 9th, 1847) £14,800 had been paid up. The quantity of copper ore raised is upward of 300 tons. The company is governed by a board of directors, in conformity with the provisions of a deed of settlement, the qualification being a proprietorship of scrip to the extent of £150.

The present board of directors consists of the following gentlemen:—Messrs. G. F. Aston, C. H. Bagot, J. Hart, Joseph Johnson, Geo. Morphet, Thos. Shepherd, and E. J. S. Trimmer. E. A. Wright, secretary.

A shipment of ores per *Mary White* realised £16 3s. 2d. per ton, clear of freight and all charges in England, and there is reason to believe that subsequent shipments will, in due time, show results equally or more satisfactory. There is every reason to believe that the Princess Royal Mines are an exceedingly valuable property, and will soon be amply remunerative.

RAPID BAY MINES (COPPER AND LEAD).—One of the mines is the property of the South Australian Company, but was suspended in consequence of the more valuable discoveries made on the company's account in the Mount Barker district.

Another mine is comprised in an 80-acre section, the property of Mr. George Phillips, and has been productive of copper, lead, and zinc, some of all of which have been shipped to England, and pronounced excellent of their kinds. A few men occasionally employed on tribute have raised 50 tons of lead, a few tons of copper, and a small quantity of zinc ore. This mine is distant 65 miles from Adelaide by land, but has the advantage of easy communication with the Port by water.

During the last year a mineral section (1552) near Rapid Bay was bought from the Government by Mr. G. M. Waterhouse, of Adelaide, on account of the valuable copper ore found thereon; but as the visible lode is only approachable by water,

the property will probably remain in abeyance till it claims the notice of some practical miner with sufficient leisure to examine the property throughout, and influence enough to procure the introduction of British capital.

RIVERSEDGE MINE.—This undertaking, distant 13 miles from Adelaide, on the banks of the Torrens, is also of recent date, but has already excited much attention. It was first wrought for copper, but a lode of lead has also been discovered, and Dr. Davy's assay of this last-mentioned ore has proved it to be rich in silver beyond any precedent in the old or new world, the proportion being $1\frac{1}{4}$ per cent., or about 627 ounces avoirdupois to the ton of ore.

The proprietors of this property being slow to incur the outlay indispensable to its development, it has, we believe, remained in abeyance for several months.

ROYAL MINING COMPANY.—The Royal Mining Company's subscribed capital is £100,000, in 10,000 shares of £10 each, the amount paid up since the origination of the company, in October, 1846, being only £5,000.

Lands to the extent of 720 acres, chiefly in the neighborhood of Kapunda, have been purchased at a cost of £1,500, but no discoveries of importance have been made. The directors of this company bought lands at a Government land sale, in special conjunction with the local directors of the (London) Australian Mining Company, and the sections being appropriated by lot subsequent to sale, as had been arranged, the best of the bargain seems to have fallen to the London company; for immediately after the secretary of the Royal Mining Company issued an advertisement offering rewards to miners for the discovery of lodes on the company's sections.

The affairs of the Royal Mining Company are controlled by a managing committee of 19, composed at present of the following gentlemen:—Captain Bagot, Messrs. C. Beck, C. F. Campbell, H. Collier, F. H. Dutton, A. L. Elder, A. Hardy, Jos. Johnson, P. Levi, E. L. Montefiore, J. B. Neales, W. Paxton, W. Peacock, C. M. Penny, M. Smith, E. Solomon, P. J. Todd, and W. Younghusband.

A discovery of some importance has been made upon the property of this company; and it is alleged that more important ones would have proved the undoubted value of the lands purchased if the workings had partaken less of the character of mere surface operations.

VICTORIA (GOLD) MINE.—The Victoria Gold Mining Company possesses two sections, comprising 147 acres, at a distance of 10 miles from Adelaide. Soon after the operations of the company commenced a vein of auriferous gossan was discovered in the principal shaft, and at length it was found impregnated with native gold of almost perfect purity. Genuine specimens of the gold soon adorned the cabinets of the curious, and the working jewellers of Adelaide were employed to mount South Australian gems in some of the virgin gold thus produced in the province. The excitement produced was extreme; the £2 shares went rapidly up to £30 each, and the *fortunate* purchasers at the advanced price thought their fortunes were made; but all at once the prizes were very much the appearance of blanks. A ruinous reaction ensued; the price of shares went down to £3 each; and, although there cannot be a doubt that the mine will eventually be rich in metallic substances, if not in gold, the ideal glory is departed, and shares are not likely to revive until a vein of "yellow gold," or a monster lode of copper, again awakens the trumpet of fame on behalf of the holders.

The company was established in January, 1846, with a paid-up capital of £1,500, in 750 shares of £2 each. There are seven directors, whose respective qualifications are the possession of scrip to the amount of £20, at the original price. The gentlemen at present holding office are Messrs. Neales, Wickstead, Williams, Fairlie, Sleman, and Dr. Davies. The quantity of gold realised by the proprietors is stated at not exceeding 24ozs.; but the facts and circumstances of the discovery created an intensity of interest here and elsewhere that will not presently subside. At present the number of men employed does not exceed five or six.

THE WAKEFIELD MINE (COPPER).—The Wakefield Company, so called from the position of their 160 acres of land near the Wakefield River, commenced operations in November, 1845, with a paid up capital of £1,300 in 650 shares of £2 each.

Five directors are chosen from the general body of shareholders, no amount of qualification having as yet been fixed. Only a few men have hitherto been employed. The distance from Adelaide is 69 miles.

A copper lode of considerable regularity is being operated upon, the quality of which is sufficiently encouraging; and very lately the prospects of the mine are so much improved that an extended scale of operations will doubtless soon become advisable. The managing director is in England, and it is thought the suspended operations at this mine will not be resumed until his return to the colony.

WHEAL GAWLER (SILVER-LEAD) MINE.—Wheal Gawler Silver-lead Mine is on an 80-acre section, which is partially bounded on the west by the Glen Osmond property, and wholly on the south by the Wheal Watkins.

Wheal Gawler was the first mine opened in the province of South Australia, the inducement to open the land and commence operations having been the discovery of rich specimens of galena on the surface. Soon after the purchase, in May, 1841, mining operations commenced, and several tons of extremely pure galena were raised. Several subsequent discoveries of a still more promising kind have been made near the surface and in depth; but as the total quantity of ores raised has not exceeded 10 or 12 tons, it may at present be called a prospective rather than a productive mine. The prospective value is, however, so well supported by the richness and purity of the ores raised, and other collateral circumstances, that no doubt exists in the minds of the proprietors as to the complete success of their spirited outlay.

The operations having been discontinued by the original proprietors, the land was subsequently leased at a twelfth dues to the present proprietors, who have since purchased it of them. The property is held in 128 shares by a few private individuals, H. C. Stakemann, Esq., being the managing proprietor. The works are being vigorously prosecuted by from 16 to 20 miners under the superintendence of Mr. Edward Henkel, an experienced gentleman, who, up to the period of his emigration to South Australia, held a responsible situation at the Hanoverian Government Mines in the Hartz Mountains. At the level of the present horizontal workings, lumps of clean ore of various sizes, some weighing as much as 84lbs. each, have been found in a lode averaging more than 4ft., of which it is confidently predicted that it alone will make the mine a valuable one. No less than nine other lodes, all of the most promising appearance, have, however, been already discovered, and will be operated upon in regular succession. The concurrent reports of several thoroughly experienced mineral surveyors are quite conclusive as to the great value of this property.

The mine is only three and a quarter miles from Adelaide.

Two of the deep levels have not only been driven to their expected points of profitable intersection, but have cut two of their respective lodes, and these have begun to yield some portions of rich mineral treasure.

WHEAL WATKINS (SILVER-LEAD) MINE.—Wheal Watkins Silver-lead Mine is on an 80-acre section which adjoins the Glen Osmond property, to which it is second only in productiveness and prospective value. The agent in the colony is Peter Peachey, Esq. The ores exported from this mine have amounted to several hundred tons, mostly obtained at a very shallow level; but the lode, which is a very regular one, has now been intersected at some depth, and the productiveness of the workings will be very much increased. The property was purchased from the Government in December, 1841, and most successfully opened as a mine in 1843, being distant from Adelaide less than three and a half miles. This mine has continued steadily productive. At the time of our going to press it has at the Port, or ready for removal to the wharf, ores to the value of £1,000 or more.

YORKE'S PENINSULA COPPER MINE.—This is undoubtedly a valuable property, and, as the difficulties in the way of profitable employment have been removed by the purchase of a 14 years' lease of 36 acres sea frontage from the Government, a spirited prosecution of this property will doubtless add largely to our mineral exports. The strip of sea frontage obtained is not only rich in copper ore, but, being capable of easy transverse perforation, will afford a ready underground access to the mineral lands within.

There are several other undertakings in the mineral field of South Australia, which are neither designated by any express appellation nor distinguished by mineral returns of value, and such we forbear to descant upon ; although we believe some of them, if situate in an English mining county, would successfully invite capital and ensure the labor necessary to demonstrate their value.

Several mineral districts of South Australia are doubtless yet untouched, some are officially sealed, others are circumstantially in abeyance ; but enough is doing to excite admiration and convince every unprejudiced inquirer that South Australia—capable as it is of feeding an immense laboring population without importing a single article of provision, and proving as it has the reality of its pretensions by exporting £174,000 worth of metallic ores produced by comparatively a handful of men in a single year—is destined to become an exporter of minerals or metals to a vast extent.

RECORD

OF

THE MINES OF SOUTH AUSTRALIA.

FOURTH EDITION.

NOTE.—*The letters I.M.R. denote Inspector of Mines Report.*

COPPER.

ADELAIDE COPPER MINING COMPANY.—In 1846 this company was formed to work section 5526, hundred of Onkaparinga, situated 12 miles N.E. by E. from Adelaide, near the Victoria Gold Mine. About 70 tons of ore were raised ere the men abandoned the mine, and joined the rush to the Victoria gold diggings, in 1851-2. There are eight or nine lodes, nearly vertical, or having a very slight underlie to the W. In some places the lodes come together and form large bunches of quartz and copper ore; strike S.W. and N.E., and width varies from about 6in. to 6ft. The ores consist of carbonates and grey and yellow copper ore, associated, in some instances, with silver and gold. About 1883 5 tons of ore, from a lode E. of the old workings, yielded 22½ per cent. of fine copper. Noticeable features in the workings are the great number of shallow drives, the number of parallel lodes that have been struck, and the fact that they all carried ore more or less near the surface. Acting Inspector Parkes examined and reported (18-12-91) that a syndicate was then raising fair copper ore, and that there were several segregated veins and bunches of ferruginous quartz stained with carbonate of copper in the workings. Tunnels had been driven on the course of these veins which had disclosed lodes. Pumping machinery and thorough prospecting were necessary. Small quantities of silver and gold were detected in the ores upon assay.

AJAX COPPER MINE (previously named "Emu Creek," and also "Elvena").—Situated about 10 miles N. of Beltana. Inspector Parkes, reporting in 1892, states that 70 tons of 44½ per cent. and 20 tons of 25 per cent. ore had been taken from this mine; he regards it as worthy of being fully tested by deeper sinking and drives. Inspector Matthews reports that a shaft has been sunk to a depth of 100ft., the formation being about 2ft. wide, and composed of brown iron-stained slate material. The copper is principally green carbonates, occurring in veins and pockets. No work had been done for six years. It was stated that 5 tons of 43 per cent. ore had been raised. At the time of the inspector's visit men were engaged in dressing up the old dumps, and had a small parcel on hand, probably averaging 8 per cent. to 10 per cent.—(I.M.R., 7-12-99). An examination was made in August, 1902. Harvey's shaft is sunk to the depth of 112ft., and at water-level (94ft.) a drive has been made E. 25° S. for 30ft., and at 10ft. in from the shaft a winze was in progress. Above the drive, S.E. from the shaft, the lode has been stoped out for a length of 15ft. and a height of 40ft. At the same level, on the the N.W. side of the shaft, a drive has been made about 12ft. with a crosscut N. for 8ft. The shaft follows the underlie of the lode N., nearly vertical. The strike of the lode is S. 65° E., and varies in thickness from 1ft. to 4ft. 6in.; it consists of quartz and ferruginous argillaceous mullock, containing chalcocite and siliceous copper glance. The shoot of ore is short and apparently dips along the lode from N.W. to S.E. At surface both N.W. and

S.E. from Harvey's shaft, costeans and pits disclose other veins of copper ore, mostly carbonates, which appear to cut across Harvey's lode diagonally; they are all worth opening up in a systematic manner. About 11 tons of first-class ore had been recently mined and sent to the smelters. (George, 27-8-02.)

ANGO COPPER MINE.—Seven miles E. from Blinman. Shaft, 60ft. deep; at 40ft. a level was driven 15ft. on course of lode, which is 3ft. wide, dipping at a slight angle to the S.E., and composed of felspar with small veins of chalcopyrite and chalcolite. (I.M.R., 4-2-91.)

ANNESBURY'S CLAIM.—Situated about 10 miles N.E. from Belton. Here a formation consisting of ferralcite, dolomitic limestone, and calcareous and argillaceous matrix, carrying blue and green carbonate ore strikes N.E. and dips 55° N.W. The country rock is calcareous slate. In the recent workings it has been traced by pits and excavations for 3 chains, and, in connection with the previous workings in the S.W. portion of the property, copper has been traced for 25 chains. The deepest excavation at the present workings is 18ft.; the sinking has been in the formation throughout, and its width, therefore, is over 4ft. Samples taken across the face, and assayed, without picking, 18.5 per cent, 2.9 per cent., and 5.2 per cent. The place is well worthy of vigorous prospecting. The formation should be followed down to a fair depth, and then driven on along its course both ways. (D.R. (Gee), 11-7-06.)

APEX HILL MINE.—Situated in rather rough, hilly country, 176 miles N.N.E. from Port Augusta, Mount Lyndhurst district. A lode running about N.E. and S.W. is traceable for about 150yds. on the surface, its back consisting of ironstone, with quartz and copper ore. Stains of copper are found in places away from the lode; there are very strong green stains on the face of a precipitous rocky hill at one side of the creek, while the hill on the opposite side is covered with blue stains. The ore in the lode, not very rich, looks promising, and consists of green and blue carbonate, with a little grey ore. (Austin, 1863.)

Situated about 1½ miles S.E. from Apex Hill. Outcrop about 15ft. across, traceable for a short distance along the surface; it consists of calcspar and ferralcite, with veins and vughs containing iron gossan and occasional bunches and scattered knobs of copper sulphide. Strike N. 70° E., dip S.E. 20°. At 30ft. below this outcrop a tunnel has been driven S. 7° E. for 170ft.; the first 90ft. through boulder and pebble conglomerate, and then 80ft. through calcareous slate with small veins of calcspar lin. to 2in. thick. In the face a lode of calcspar 4ft. thick is exposed containing vughs of iron gossan and a few isolated small knobs of copper sulphide. (George, 25-4-04.)

APPEALINNA MINE.—Situated about 40 miles in a N.N.E. direction from Hawker W. of Mount Carnarvon, and 9 miles E. of Wilpena Head Station. For 35 years it remained unworked, being abandoned in 1860-1. Working recommenced at the end of 1896. In August, 1897, the Government Geologist visited and reported—The lode outcrop consists of a brecciated and conglomeritic limestone containing green carbonate of copper, copper glance, copper pyrites, and native copper, associated with gossan, iron oxides, pyrites and specular iron, calcspar, carbonate of lime, and iron. A good wall on S. side, none apparent on N. side of lode, which merges into the country rock, containing a considerable percentage of native copper. Strike of lode formation, 15° E. of N.; dip, about 80° N., with varying width; 3ft. wide at 77ft.; proved for a length of 100ft., and worked out down to 50ft. in 1859. At 77ft. there is a strong lode formation carrying a good percentage of copper ore, which should encourage deeper sinking, with a probability of payable copper being opened up in the lode.

In November, 1899, Inspector Matthews examined the property and reported:—The lode outcrop is composed chiefly of limestone formation, and can be traced through the full length of the blocks; it shows green carbonate and grey ore in places, but so far work has been concentrated on block 157, where three shafts are sunk to various depths, connected by drives and stopping down at the 50ft. level;

No. 1, the main shaft, has been sunk to a depth of 112ft. on the same underlie as the lode. At the 50ft. level a drive has been made S. of W. and connected with No. 2 shaft. The lode formation, which is most favorable for copper-bearing, has been proved to a width of over 20ft.; it contains veins and bunches of high-grade ore, is very erratic in its course, and in places much disturbed. A sample taken from the ore bunches assayed $45\frac{1}{2}$ per cent.; a general sample gave $7\frac{1}{2}$ per cent., the former being black oxide and the latter chiefly green carbonate. At the 100ft. level a crosscut is started in the lode formation, exposing similar material as at the 50ft., except that the ore has changed to a sulphide; it is not payable at this point, but by continuing the crosscut towards the hanging wall better ore will probably be met with. No. 2 shaft is sunk to a depth of 84ft., passing through the lode similar in character to No. 1, at 70ft. A sample taken from one of the veins containing copper glance assayed $58\frac{1}{2}$ per cent. No. 3 shaft, situate a little N.W. of No. 2, has been sunk to a depth of 70ft., and from the material raised is entering the lode matter. There is a considerable quantity of ore exposed between No. 1 and No. 2 shafts. An average sample from the 30ft. level assayed 6 per cent. Here the lode is from 6ft. to 10ft. wide; below this there is more intrusive rock with veins of rich ore. The lode is not so regular and defined as above, but from the 50ft. level to the surface there is stoping ground containing apparently a fair quantity of high-grade ore that can be hand sorted out, leaving the low-grade stuff for future treatment. A small furnace to reduce the ore to a matte would greatly lessen the cost of transit. The then proprietor had sent away over 20 tons of ore, worth an average of 34 per cent. The small pumping plant can cope with the water then met with, but should prospects improve sufficiently to warrant sinking a main vertical shaft, opposite No. 1, for the purpose of developing the property at a deeper level, a larger plant would be required. (I.M.R., 24-11-99.) An examination was made in August, 1902. Work was then in progress on an "indicator," vein parallel to and N. of the main lode. It varies from 3in. to 3ft. in thickness, and is composed of micaceous iron, argillaceous and calcareous mullock and calcspar. The copper ore occurs in pockets and bunches, and consists, above water-level, of atacamite, grey ore and carbonate with a little ruby oxide, below water-level, copper pyrites and a little malachite and atacamite. Crosscuts, from near the bottom of No. 2 shaft (78ft.) N. 15° W. struck the "indicator" at 15ft., from the bottom of No. 3 (92ft.) S. 8° E., 38ft., and from 50ft. down in No. 3 S. 35ft., and the ore-carrying body has been driven on and stoped from these points. Above the 50ft. level the main lode has been stoped to surface between Nos. 1 and 2 shafts for almost the full length. During the first six months of 1902, $98\frac{1}{2}$ tons of ore were sent away, the gross value being £968. (27-8-02.) During the last six months of 1906, $76\frac{1}{2}$ tons of 30 per cent. ore were treated, and during the first six months of 1907, $101\frac{1}{2}$ tons, 30 per cent.

APPEALINNA EXTENDED COPPER MINE.—Situated about 41 miles N.N.E. from Hawker, and 1 mile from the Appealinna Mine. The lode formation strikes E. and W., and is 6ft. wide. A shaft has been sunk to a depth of 50ft., disclosing a few small veins and pockets of red oxide and green carbonate, also a large quantity of specular iron. At 45ft. from the surface the shaft entered a more dense rock, with small spots of sulphide, and at the bottom a crosscut was driven through the formation, which at that point contained large quantities of pyrites, but no copper of any value. About half a ton of ore, estimated to contain from 20 per cent. to 25 per cent. of copper, had been sent away. (I.M.R., 8-11-99.)

APPEALINNA HOMEWARD BOUND.—Situated 4 miles N.E. of the Appealinna Mine, and 44 miles N.N.E. of Hawker. A strong calcite lode, 5ft. wide, runs through the property, and on it a shaft has been sunk to a depth of 20ft., where the lode maintains its width, and contains green carbonate, grey ore, and iron gossan, and although the material is at present of low grade, the prospects are encouraging, and sinking should be continued. (I.M.R., 9-11-99.)

AUSTRAL BLOCKS.—Situated 1 mile N. of the Victory Mine, 18 miles from Leigh Creek. Several small openings have been made to the depth of 5ft., upon a slate formation striking E. and W.; one of these disclosed a body of promising material 4ft. wide, carrying an encouraging percentage of green carbonate. It is well worth further prospecting, first by cross trenches, and then by sinking prospecting shafts at the most favorable points. A sample taken assayed 12 per cent. (I.M.R., 12-1-00.)

AUSTRALIAN MINING COMPANY.—Established in London in 1845, with a subscribed capital of £400,000, in 20,000 shares of £20 each, of which (in 1847) £40,000 were paid up. Their principal properties were at Tungkillo, Reedy Creek (34 miles N.E. from Adelaide), and at Charlton (14 miles S. of Mount Remarkable). (See CHARLTON, TUNGKILLO, and KITTICoola.)

AYLIFFE'S PROSPECT, Hundred of Uroonda.—On the same line of outcrop as Jago and Harris's claim, about $\frac{1}{2}$ mile distant. Copper ore of low percentage occurs in a bedded lode formation 2ft. to 3ft. thick, which has been followed down on its inclination 80ft. No payable deposit found.

BALHANNAH COPPER AND BISMUTH MINE.—The late Mr. J. B. Austin contributed the following note for a former edition (1887) of the "Records." :—

The mine was first worked for copper, of which a considerable quantity was obtained near the surface. Bismuth was found associated with the copper, and the quantity increased, until it appeared likely to prove more valuable than the copper. Gold was found in the bismuth, and some beautiful specimens of small nuggets of pure gold in native bismuth were met with, the precious metal being in the proportion of 5ozs. of gold to 1cwt. of bismuth. Cobalt in small quantities, also antimony and plumbago, are said to have been found in this remarkable mine. The workings were carried down to a depth of 50 fathoms, where there is a wide but dredgy lode, yielding about 1 ton of bismuth to the fathom, with some copper and gold. From £25,000 to £30,000 worth of copper was raised from this mine, and about £7,000 worth of bismuth. Some exceedingly rich specimens of gold in ironstone gossan were obtained, and several nuggets, the largest weighing about 2½ozs. A considerable quantity of white carbonate of iron is also found.

The Government Geologist (March, 1898) issued a full report, with diagrams, from which these particulars are taken :—The mine is situated on section 4048, hundred of Onkaparinga, and was worked by the Balhannah Mining Company, Limited, from 1867 to 1876. No work has been done since in the way of mining, but in 1883 the mine was unwatered, with the object of restarting. Nothing further was done, and shortly afterwards the machinery was removed from the ground. The shafts and old stopes are nearly full of water (March, 1898), and can only be inspected for a few feet from the surface; the position and trend of the lode is only ascertainable from these and from the various openings and portion of the outcrop left standing, while only from the veinstones and metallic minerals contained in the spoil heaps raised from these shafts, and lying on the surface, can the nature of the lode formation be studied. From these heaps ores of copper and bismuth can easily be picked out; also native bismuth and sulphide and carbonate of bismuth, while gold can be obtained by washing. The veinstones consist of gossan, brown iron ore, pyrites, quartz, spathic iron, calcspar, &c. The metallic minerals are copper pyrites, native copper, carbonate of copper, &c., native bismuth, sulphide of bismuth, carbonate of bismuth, gold, silver, galena, zinc-blende, &c.

The Eastern Shaft, near the engine-house, was called the "New Engine Shaft." It is the main shaft, and from it the latest mining was carried on. Thence going W.

No. 1 Shaft.—The water in this shaft stood at 10ft. from the surface. A section of a quartz and mullock reef, 3ft. to 4ft. wide, is exposed, striking N. and dipping E. It is apparently a cross reef.

No. 2 Shaft.—This was called the "Escape Shaft." The water stands at a short distance from the surface.

No. 3 Shaft.—This has fallen in, but a portion of a wide lode formation is exposed near the surface; the ground below has apparently been stoped out.

No. 4 Shaft.—This was known as the "Jeweller's Shop," on account of the rich specimens of gold said to have been raised from the lode here. Portions of a wide lode formation remain near the surface.

No. 5 Shaft.—A wide lode formation containing traces of copper is exposed here, evidently portion of the lode outcrop. It extends towards shaft No. 6.

No. 7 Shaft.—This was the old engine shaft.

No. 8 Shaft.—An old fallen-in shaft and filled-up stopes. The lode appears to have thinned out in this direction.

The tunnel, driven in from the level of the creek flat, has cut a wide quartz and gossan formation, and a small gossan and quartz vein; the former is a cross reef, but the latter is about in the strike of the main lode.

At the back of the engine-house a lode formation of quartz, brown iron ore, gossan, and mullock outcrops; it is 10ft. wide with a N. strike, and on the same line, at a distance of 350ft. in a S. direction, a quartz and ironstone reef, containing copper and iron pyrites, outcrops in the creek on the adjoining section: these outcrops appear to belong to the same lode, and, if so, must cross the main lode 80ft. to the E. of the new engine shaft. Other reef outcrops occur on the section, they are of quartz favorable for metallic minerals, and, if continuous, must also cross the main lode, the general trend of which is E. 20° S., the dip apparently S., almost vertical. The country rocks are argillaceous sandstones and slates, striking N. 10° to 15° W., and dipping E. at an angle of 50° or 60° . The lode cuts through the country rocks almost at a right angle, a fact which indicates its probable permanence in depth. Every effort was made to obtain reliable data concerning the working of the mine by the old Balhannah Company, but a complete set of the directors' reports and balance-sheets, &c., could not be obtained. Information, however, was gained from directors' reports of January 31st, 1872; August 19th, 1872; August 27th, 1872; and February, 1875. Balance-sheets January 31st, 1871, and July 31st, 1875. Mine manager's reports August 28th, 1871; February 20th, 1872; August 12th, 1872; February 20th, 1874; August 22nd and 29th, 1874; and February 19th, 1875.

Evidence was taken from the following men who had formerly worked in the mine: James Powell (the discoverer), T. W. Hall, C. G. Leunig, W. T. Terrell, R. A. Gillen, H. Fenwick, F. Dahl, and T. Thomas. Statements were also made by Mr. Schuetze, J. Rodert, and F. Lancks. The information relating to underground workings tends to show that the engine shaft is 300ft. and the old engine shaft 120ft. deep, and that these shafts are connected by a drive along the lode from the 20-fathom level in the new engine shaft to the same level in the old engine shaft; also that levels have been driven from the 30 and 40 fathom levels in the new engine shaft to half way in the direction of the old engine shaft; also that a level has been driven from the 50-fathom level in the engine shaft E. for 150ft. These, with the necessary crosscuts from the main shaft and the ground which has been stoped, constitute the principal workings. There is a difference of opinion as to the direction in which these crosscuts have been driven, but it appears to have been N.; consequently, the main lode, which strikes approximately E. 20° S., lies to the N. of the main engine shaft at the 50-fathom level, and has a slight underlie to the S. The influx of water is estimated at about 8,000galls. per hour.

All the declarations and reports agree in testifying that the Balhannah main lode, and the cross lode cut by driving from the new engine shaft, are of unusual size, and rich in gold as well as copper and bismuth. Some of the statements relating to the gold seen and handled are extraordinary, and appear incredible in view of the fact that the mine manager and directors did not recognise the presence of gold in payable quantity. Although the mine manager mentions gold in the lode in his reports of February 20th, 1874, and February 19th, 1875, he does not subsequently give any particulars or returns of gold extracted. It is well known that rich specimens of gold are in possession of many men who formerly worked in the mine, and the Government Geologist has been shown by local people rich

specimens of coarse gold in spathic iron, quartz, sulphide of bismuth, and copper, which, on account of the unusual character and appearance, have undoubtedly come from the Balhannah Mine.

The lode is particularly rich in the number of metallic minerals and metals it contains. The principal varieties are:—*Metals*—Gold, silver, native copper, native bismuth; *Metallic Minerals*—Carbonate of bismuth, sulphide of bismuth, carbonate of copper, sulphide of copper, iron pyrites, galena (in trace), zinc-blende (in trace), &c.

There appears no doubt that the Balhannah Copper and Bismuth Mine is also a valuable gold mine. The quantity of ore scattered about the surface in the spoil heap indicates that the lode, of which this was the rejected portion, must have been a rich one, and the specimens of gold, bismuth, and copper ore in the possession of the inhabitants of the district, and also specimens of various ores showing gold, which were obtained by the Government Geologist from these waste heaps, point to the same conclusion.

According to the last balance-sheets of the company copper ore to the value of £14,577 net, and bismuth worth £7,425 net, have been obtained from the lode, and taking all things into consideration there can be no question but that the pumping out and reworking of this mine is a first-class mining venture.

Hitherto the mine has been worked in a very unsystematic and unskilful manner, but, under the more enlightened and scientific management available at the present day for the carrying out of mining and metallurgical operations, highly payable returns of gold, bismuth, and copper should be obtained, and a permanent mine established.

Assays of Samples obtained from Waste Heaps.

	Gold per Ton.	Silver per Ton.	Copper.	Bismuth.
Gossan lode	16dwts.	Trace	10½%	3·3 %
Washed from heap	14dwts.	1oz. 1dwt.	Trace	13·4 %
Washed ore	16ozs. 8dwts.	6ozs. 4dwts.	"	88·6 %
Pyrites, quartz, and copper stains ..	4dwts.	2ozs.	"	Trace
Iron pyrites	4dwts.	Nil	"	"

The Inspector of Mines (Mr. W. H. Matthews), in his report dated December 14th, 1899, states:—All mining operations have been suspended for the last 23 years; the workings are all full of water to about 15ft. from the surface, and several of the surface openings have fallen in. Still in places sufficient portions of the main lode are exposed to form an opinion of its character, width, and permanency. Apparently there are two lodes running in different directions, known as the main and cross lodes, starting from the E. end of the workings. The latter shows fully 9ft. wide, is traceable for a considerable distance, and is composed of quartz associated with iron and iron pyrites, and on which, so far as could be ascertained, little work had been done beyond sinking a few shafts, each producing a little gold. The strike is about N. and S., the enclosing rocks being slate and sandstone. On the second, or main, lode formation, which bears E. 20° S., a considerable amount of work has been accomplished for about 600ft. in length, by the sinking of eight shafts, drives, and stopes, from which large quantities of ore were extracted; the returns showing a value of £22,000. The lode near the surface, as shown by various shafts and openings, is from 2ft. to 5ft. in width, of a siliceous material, and, from the ore raised at the deeper levels, containing a various number of metals, the principal being gold, silver, native copper, and native bismuth, distributed throughout the ore body, which, judging from careful local inquiries, is apparently making larger and of higher value as depth is attained. It has also been stated that during the time work was in progress rich gold-carrying stone in connection with bismuth was frequently obtained, but in the returns

the former metal is not mentioned. Evidently at that time the mine was being worked in the most careless and crude manner; but now, with the advantages of skilled labor and the latest appliances for the treatment of the numerous classes of metals found in the ore, there is no doubt that what was then worked at a loss could now be treated at a profit. From the waste dumps at the surface the inspector obtained gold, bismuth, and other metals, colors of gold showing in every sample washed. Regarding the lode's permanency, the inspector has every confidence that it will continue to a much greater depth than has hitherto been explored, the indications being of the usual character that accompany a true fissure lode. From this and the large returns previously obtained with the crude appliances then in use, the reopening of this mine may be classed as a fair and legitimate mining venture, that, with the necessary machinery, should give remunerative returns for capital invested. (I.M.R., 14-12-99.)

BARILLA MINE.—Situating near Mount Lyndhurst Station. Workings represented by three small batches of holes on two low E. and W. ranges that closely adjoin. The stuff exposed in each of these workings consists of soft, shaly mullock, traversed by thin seams of quartz thickly impregnated and coated with chloride and silicate of copper. Solid small nodular masses of these ores are rare, but in the two excavations near the top of the range there occurs a calcareous gossan which encloses occasional specks of grey oxide of copper. The second batch of workings lies in the same range, about 10 chains further E., and consists of two shafts about 100ft. apart. The deepest of these is about 20ft., and the two are connected by a drive. The ore deposits here are of the same character as those in the first batch. Judging from some specimens left near the shafts the ore has been of pretty good quality. The third batch of workings is situated on the N. slope of the opposite low range, about 10 chains S. of the place just noticed. There are a number of shallow shafts, and one about 40ft. deep is sunk on what appears to be a regular gossan lode 1ft. or 2ft. thick. This is combined with a quartz reef which crosses the country at a strike of W. 10° N., dipping S. at 45° to 50°, and which can be traced from this point further E. for 9 or 10 chains along the slope of the range. The gossan contains veins and patches of very good ore, composed of dense grey oxide, intimately impregnated with chloride of copper. Portions consisting of a hard siliceous brown iron ore enclose occasionally large and small parcels of red oxide and specks of native copper. There are three parallel quartz reefs which occupy conjointly a width of 40ft. to 50ft., and extend for 4 or 5 chains in length at a strike nearly E. and W., with apparently a steep S. dip. The quartz is full of patches, and is traversed by veins of brown iron ore, but shows no copper indications. As regards the country traversed by the cupriferous gossan veins and quartz reefs, it consists of white and grey, much jointed, feldspathic-looking slates, alternating with slaty, more or less ferruginous sandstone. Mean strike E. 5° N.; dip N. 5° W., at 33° to 35°. Considering the character of the copper ore, and that it occurs in gossan veins connected with well-defined quartz reefs, which are true lodes, the last-mentioned place represents encouraging prospects. Prospecting for gold in the alluvial drift of the gully and on the surface of some of the slopes of the adjoining ranges, would be advisable, as the country does not look unlikely for this metal. (Ulrich, 1872.)

The Inspector of Mines reported (20-10-90) an examination—A shaft, vertical and underlie, sunk on an outcrop, and numerous shallow pits; small segregated veins of ironstone and carbonate of copper shown; strike E. and W. through calcareous and indurated slates. His opinion was that the main lode had not been touched, and that it contained "a first-class show."

An examination made in August, 1902, showed that in the N. workings copper ore, consisting of copper glance and carbonates, occurs in bunches and seams, associated with quartz and iron oxide. At the S. workings ferruginous copper and malachite occur in a large quartz blow, associated with ferruginous calcite. Tributaries were at work, and had sent 18½ tons of ore to the smelters. (George, 27-8-02.)

BALCANOONA MINE.—Situated on the E. side of the Flinders Range, about $1\frac{1}{2}$ miles W. of the old Mooroo Mine, and about 50 miles E. from Beltana. Two shallow pits, some costeans, and surface workings have been made on the E. side of a quartzose sandstone spur running diagonally across the strike of the bedding planes of the sandstone. Irregular patches of blue and green carbonate impregnate the sandstone. Small thread veins, consisting of quartz with copper carbonate, and occasionally a little grey ore, can be traced laterally and downward for a few feet, and then appear to die out; the sandstone on each side of these veins is heavily stained with copper carbonate, and copper stains in patches and bunches appear in the sandstone bed for a thickness of about 40ft., but no defined vein or lode exists. A picked sample of the stained rock assayed $17\frac{1}{2}$ per cent. copper; it is not suitable for concentration by machinery. (George, 17-6-01.)

BARATTA COPPER MINE.—Situated 70 miles N.E. of Carrieton, and 15 miles from Baratta Station. The workings consist of open cuts and several small shafts, sunk to various depths, over country extending for about $\frac{1}{2}$ a mile in leases 1643-4, from which all the ore up to the present time has been extracted. The lode outcrop strikes about E. and W., with an underlie to the N., and has been traced for a considerable distance by a large number of openings; it ranges from 2ft. to 4ft. wide, and contains copper-bearing material from 6in. to 15in. thick, except at the W. end, where it has proved much larger, and is composed of iron, iron gossan, and calcite with veins, bunches, and splashes of green carbonates and grey ore, the latter predominating, associated strongly with iron—a good smelting ore, but difficult to dress to a very high value. Towards the W. end of block 1643 an open cut has been worked for about 60ft. in length, the ore-vein being from 4ft. to 5ft. thick, and from the quantity raised must have contained good deposits of fair-grade ore. A little to the N. of E. of the open cut the main underlie shaft has been sunk to the depth of 115ft., being only 30ft. vertical from the surface. At 40ft. on the underlie the enclosing rocks have contracted, and the vein narrowed to 3in., of very little value. Still further E. three other shafts have been sunk to a depth of 15ft. each; from these the principal work has been done, the ground being stopped out for 130ft. in length by 32ft. in width, and a large quantity of ore obtained; the E. face of the workings still showing lode matter from 2ft. to 3ft. thick, containing throughout bunches and splashes of fair-grade material. In block 1644 also a large amount of surface prospecting has been done, and a quantity of ore raised from the various openings which expose the formation 2ft. wide, the ore vein being from 6in. to 15in. thick; the matrix is iron gossan, with grey ore occurring as previously described. At the E. end of the workings a tunnel has been driven on the course of the lode 80ft.; the vein ranges from 4in. to 8in. wide, and contains green carbonate, grey ore, and small nodules of malachite of good grade, but the vein in bulk is of very low value. Little or no further work has been done beyond tracing the vein on the surface, where, in most places, it proves to be more or less copper-bearing. Work so far has been limited to very shallow depths, and to further prospect the property one or more inclined shafts should be sunk, where the best and largest ore bodies were obtained; the vein underlie and slope of the hill being too great to permit of vertical shafts being sunk for exploration purposes to any reasonable depth. It was stated that about 160 tons of 20 per cent. ore had been obtained from the mine. (I.M.R., 3-1-00.)

BAROOTA NOB.—Mining operations were being carried on in the hundred of Baroota, and the inspector stated that the vein worked upon was highly mineralised and should be further prospected, as also a parallel vein about 12ft. E. (I.M.R., February, 1895).

The work of the syndicate formerly holding the place consists of one shaft, sunk to a considerable depth, several small openings, and an open cut, from 3ft. to 15ft. deep, and about 50ft. in length; this latter exposes a vein from 12in. to 18in. wide, consisting of quartz and calcite, and containing a small percentage of copper. It

has an auriferous appearance, and it was stated that some years ago good gold-carrying samples were obtained, but the samples taken by the inspector on this occasion did not on assay show any gold, and only returned up to 1 per cent. copper. (I.M.R., 11-3-04.)

Situated in exceedingly rough country, 16 miles S.W. from Melrose. The present workings are a short distance down the S. side of a steep spur about 15 chains S. of the Old Baroota Nob shaft. An excavation, about 40ft. long, and attaining a depth of 16ft. at the S. end, has been made on a vein consisting of ferruginous quartz, copper pyrites, malachite, and calcite, about 6in. wide at the top, and near the bottom it is divided by a "horse" of country, 1ft. thick at the widest part, into two veins 1ft. 6in. each in thickness, which will probably be found to join again in depth. An average sample taken across these veins at bottom assayed 8.1 per cent. copper. The copper-bearing formation strikes about N.E., and underlies 60° S.E. About 60ft. down the hill a small opening has disclosed the same formation about 3ft. 6in. in width, and a sample from across it has given 3.9 per cent. copper. About 10 chains to the W. a small pit has been sunk on another copper-bearing vein, apparently similar to the first one, except that it seems to dip in an opposite direction, viz., N.W. Surface indications of other veins have also been found. The find may be regarded, generally, as a very good prospecting show, well worthy of development, the most economical and satisfactory manner of doing which would be to continue sinking on the E. vein, and, for the present, operations should be confined to following this down, thereby testing the ground at depth and also obtaining a certain amount of copper ore. At the old workings, which were originally started about 12 years ago, in search of gold, a small opening S.W. of the shaft has been made on a vein of quartz and calcite showing splashes and spots of blue and green carbonate and red oxide. (D.R. (Gee), 11-6-07.)

BERNINI'S CLAIM.—A new discovery, situated at the head of Wallace's Gully, and about $\frac{1}{2}$ a mile N. from the Wheal Frost. A lode formation, consisting of quartzite, with water-worn boulders of quartz and quartzite, containing small lumps of copper glance and heavily stained with green carbonate, strikes S. 20° E., and underlies to the E. It has been opened up by a shallow pit, and is 3ft. thick; a shaft is in progress. A sample taken assayed a trace of gold, 20zs. 1dwt. silver, and 20.3 per cent. copper. The lode crosses Wallace's Gully, from which a considerable quantity of alluvial gold was taken some time ago. (George, 25-4-04.)

BENALACK MINE.—Situated about 1 mile E. of Nicol's Nob, formerly known as "The New Mount Ogilvie Find," and also as "The Nicol's Nob Mine." Some gold was originally found associated with the copper. The Inspector of Mines reports:—The principal work in the S. block has been done on two lodes or veins about 40ft. apart, and diverging as they continue N.; these have been worked by two shafts and open cuts, the former being 32ft. and 70ft. deep respectively. The main, or 70ft., shaft passes through two veins. The first is 3in. thick, and contains small seams of sulphide; the second, which is termed the main lode, is 10in. thick, consisting of calcite formation, in places carrying very fair ore, capable of being hand-dressed up to about 25 per cent. On this a drive has been made north from the crosscut 54ft., the lode formation being the same, but the face showing ore of poorer quality, having the appearance as if the drive had passed over the better class material. Sample taken from the deepest workings gave 29 per cent. About 200ft. S. of the main shaft a prospecting shaft has been sunk to the depth of 32ft.; the vein from the surface to the bottom averages 4in. wide, and is composed chiefly of iron gossan, carrying green carbonates and grey ore of good grade. A sample of the latter gave 30 per cent. In the bottom the vein has apparently faulted, but if the shaft is continued, will probably make again. About 150yds. N. of the main shaft there is an open cut, on a vein 15in. wide, with seams of good ore on the foot and hanging wall sides, consisting mainly of grey ore, with a little green carbonate. There are also a large number of other surface openings

throughout the block, in most cases exposing small seams and veins, containing more or less copper ore. The N. block has been worked by three shafts, each sunk to 30ft., and an open cut, total works being about 7 chains in length. The vein of ore ranges from 3in. to 6in. wide, composed of ironstone, green carbonates, and grey ore of a silicious nature; at times ore of good grade has been obtained. The enclosing rock is hard shelving clay slate, having the same strike as the vein N.W. To thoroughly test the value of this property a main vertical shaft should be sunk in the S. block, E. of the present workings, to a depth of 200ft., and crosscuts driven to intersect the various ore veins known to exist on the surface; this would prove their value below the water-level, 70ft., and would open up a large extent of unexplored ground. (I.M.R., 22-11-99.) The mine was worked for a short time by a company, which suspended operations, and wound up for lack of capital. The ground is now held and worked. (1907.)

BILLEROO MINE.—Locality, 20 miles N.W. from Bimbowrie Head Station. The property has six lodes—three parallel, two crosscourses, and a “blow.” The main lode bears N.E. and S.W., and is about 24ft. wide. Eighty tons of grey ore have been sent away, of a percentage varying from 28 to 75. Three shafts have been sunk, the deepest 120ft.; and a drive has been put in to a length of 20ft. In one place a face of ore was met with 5ft. wide, and containing 75 per cent. of metal. The veinstone consists of quartz and gossan, and the country rock of schistose slate. The mine was opened about 1874. (1899.) Fair results have been obtained recently. Returns for the six months ended December 31st, 1906, show 12 tons 18cwts. of ore treated for 1 ton 13cwts. 2qrs. copper.

BIMBA HILL.—This mine is situated 10 miles N.N.E. from Bimbowrie Station. The Government Geologist reported (March, 1897) a shaft sunk 50ft. on the underlie, with a lode formation of siliceous iron, iron oxide, gossan, &c.; strike, N.E. and S.W.; dip, 55° N.; contains a small percentage of copper, and a bunch of good ore is said to have been found. The formation is favorable and continues strongly for a distance of $\frac{1}{2}$ a mile or more, and is worthy of thorough prospecting. The country rocks consist of micaceous flaggy slates and schist, clayslate, quartzite, and metamorphic sandstone, striking N. 10° to 20° E., and dipping vertically and at high angles, and penetrated by granite dykes, quartz, and ironstone reefs.

BINGO (Wallaroo Central).—From this mine, adjacent to the Wallaroo Mine, it is believed that considerable quantities of ore were obtained before reaching the 10-fathom level. There was reputedly a lode 7ft. to 8ft. wide of grey ore, trying 40 per cent. for fine copper. At greater depth the lode was lost, and never was recovered (1899). Recently a company was formed, and, with the assistance of a Government diamond drill, the following bores have been put down:—

No. 1 Bore.—Started 101ft. 6in. back from the line of lode, and is sunk at an angle of 83° 30'. At 244ft. lode formation consisting of quartz and dolomite was entered, and at 251ft. the drill passed through 3ft. 10in. of lode, assaying 2 per cent. to 13 per cent. copper, the average being 7 per cent., also carrying 2dwts. gold per ton. The bore was then continued through lode formation carrying a little sulphide to 370ft., making total drilling in formation 126ft. After passing through the formation, drilling was continued in footwall country to 393ft. 3in., when sinking was discontinued and it was decided to start No. 2 bore, 49ft. 6in. further back from the line of lode, and drill in the same direction as No. 1.

No. 2 Bore.—Started 151ft. back from the line of lode and was drilled to a depth of 573ft. 9in. At 408ft. the drill cut into lode formation similar in character to No. 1 bore, showing nice splashes of sulphide and continued in same 16ft. 9in. The continuation of the formation to a depth of 424ft. 9in. was thus proved.

No. 3 Bore.—Started 123ft. 10in. in a S.E. direction from No. 1 bore, and 110ft. back from the line of lode. It was drilled at an angle of 81° 30', and continued to a depth of 352ft. At 187ft. 6in. the drill passed through 1ft. 6in. of lode formation carrying a little sulphide.

No. 4 Bore.—Started 111ft. 7in. N.W. from No. 1 bore, and 102ft. 6in. back from the line of lode. It was drilled at an angle of $81^{\circ} 30'$, and at 357ft. it entered the lode and continued in the same for 16ft. Samples assayed from .3 per cent. to 3.8 per cent. copper. Drilling was continued to a depth of 402ft., at which depth operations ceased. The Inspector of Mines, reporting on this boring, says that he considers the results highly satisfactory; it has proved the metal-bearing formation to continue at a depth of 424ft. Portions of the drill core from Nos. 1 and 4 bores showed very rich yellow sulphide, other portions being of little or no value, making the bulk sample of each core much less in value than would be obtained in ordinary working, as in the latter, so far as possible, all barren material would be discarded, as is done in other mines working in the district. To further develop and work this property it is advised that a main shaft be sunk midway between Nos. 1 and 4 bores to intersect the lode at about 500ft., and crosscuts driven to cut the lode at the same levels as intersected by the drill. (I.M.R., 26-3-07.)

BRONZEWING.—Hun. Oratunga. Six shafts sunk aggregating 168ft., deepest shaft 33ft., and 120ft. driving trying to find the lode. One hundred and twenty-nine tons 15cwt. of $4\frac{1}{2}$ per cent. and 5 tons 3cwt. of 22.8 per cent. ore raised and sold for £323; claim then abandoned. (Return 31-12-06.)

J. BURT'S MINERAL CLAIM.—Claim No. 1681, adjoining the Hamilton Mine, Mount Fitton, on the S. A prospecting shaft has been sunk to the depth of 6ft.; the lode is exposed to the full width of the shaft, and carries small seams of fair-grade copper; the enclosing rock is of a very hard nature, and is considerably stained with green carbonates. Further prospecting is recommended. (I.M.R., 1-8-99.)

BLACK FEATHER COPPER MINE.—Situated 4 miles S. of Beltana. On the surface there are two lode outcrops, 50ft. apart, striking N. and S. The W., or main lode, is fully 6ft. wide, and the outcrops show copper traces, associated with iron, for a length of over 5 chains. A shaft has been sunk to a depth of 40ft., thence a drive made along the course of the lode for 45ft.; the hanging wall side carries 2ft. of lode matter, consisting chiefly of green carbonates and grey ore, the latter being of fair grade. A sample of sorted ore assayed 27 per cent. This drive should be continued, and other prospecting shafts sunk on the line of lode. On the E. lode, which is 3ft. wide, a trial pit has been sunk to a depth of 5ft.; the vein shows green carbonates, and is sufficiently promising to warrant sinking on. Recently 10 tons, worth 17 per cent., have been sent to the smelters. (I.M.R., 6-12-99.)

BLACK QUEEN.—E. from and adjoining the Yudnamutana Mine. A lode formation, about 12ft. wide, containing small veins of green and blue carbonates of copper, has yielded some rich ore. Although the veins are small, the enclosing rock is soft, and of a favorable character, and further sinking is recommended. Several shafts have been sunk, the deepest being 65ft. Returns show that 68 tons 19cwt. have been treated for an average return of 24.87 per cent. of copper, valued at £1,127 17s. Traces of gold are obtainable in the ore. (I.M.R., 28-7-99.)

Prospecting carried on in two workings. Those on the E. boundary, known as the E. workings, and those on the W. the block lode workings. At both places shallow shafts and drives have been made on copper-bearing veins, and 69 tons of 25 per cent. copper ore raised recently (10-10-01).

A further inspection showed that the unsystematic method of mining, by following the copper veins by shallow shafts and unprotected drives, was still in progress, instead of working the mine by means of vertical shafts with proper levels and crosscuts. Between January 1st and May 30th, 1902, 21 tons of good ore had been sent to the smelters. (1-8-02.)

On another visit the crude and unmineralike style of working this good property was again noted and deplored. From June, 1902, to January, 1904, about 50 tons of ore, averaging about 20 per cent. copper, had been sent to market. (24-4-04.)

BLACK POINT COPPER DISCOVERY.—Situated on Yorke Peninsula, W. side of St. Vincent Gulf, a little S. of Ardrossan. In 1846 a block of land skirting the shore, and containing 200 acres, was bought with a view to open a copper mine. A shaft was sunk 2 or 3 fathoms upon a promising-looking lode, and a good deal of costeaning was done. Other claims were taken out, an outcrop showing below high-water mark and extending under the sea. The attempt to work these with a small capital resulted in failure; and all the workings ceased when the price of copper receded so much as to make ordinary copper-mining unprofitable.

BLINMAN MINE.—In the Flinders Range, about 2,000ft. above the Parachilna Plains, and distant 272 miles from Adelaide, and about 112 miles N.N.E. from Port Augusta. A great outcrop on a hill about 90ft. above a creek, 350ft. in length and nearly 100ft. thick, rich in copper, is said to have attracted the attention of a shepherd named Blinman in 1862. The workings consist of a main shaft 450ft. deep, from which drives have been put in N. and S., which are known as the 15, 25, 35, 50, 60, and 70 fathom levels. The longest levels N., which are the 75, 25, 35, and 50, extend 300ft. from the shaft; S., the longest level is the 15-fathom, which extends 250ft. The lowest, or 70-fathom level, has been driven 130ft. N. and the same distance S. The rock formations are crystalline siliceous limestone; bedrock, fine argillaceous and calcareous sandstone, quartzite, and, in some places, clay-slate, having a vertical dip, and striking N. and S. through the mine. The copper ores, which at the lower levels consist chiefly of sulphides, are disseminated through the rock in specks, patches or pockets, strings, and veins running in an E. and W. direction across the rocks, and also, with them, forming altogether a metal-bearing belt of strata in places 20ft. to 30ft. wide. Some of the cross veins are of considerable size, and in one or two places they are of sufficient importance to be classed as lodes. They are also richer in ore than the main ore-bearing strata which they penetrated. So far as can be seen there is no defined boundary between the ore-bearing strata and the barren rocks; in other words, the full width of ore-bearing rock has not yet been determined. By following up the rich crosscourses or putting in crosscuts this could be ascertained. The upper portions of the mine, from the surface to the 35-fathom level, have been stoped out in an irregular manner—probably the bunches of richest ore were followed—leaving large cavities separated by portions of unworked ground, which contains an appreciable percentage of copper ore, and which will probably be worked at some future time. These excavations are of considerable width, in places from 15ft. to 20ft. or more, and a large quantity of ore must have been raised from them. The present workings are at the 50-fathom level and between that and the 70. Here the ore is being stoped out to a width of 25ft. to 30ft., the workings more resembling those of a quarry than of a mine. The main shaft was at the time of the Government Geologist's visit (1888) 35ft. below the 70-fathom level. The mine possesses one or two special advantages: as the country rock is solid and without joints, no timbering is required, and the stopes, after the removal of the ore, are left open; and all the material raised from the mine is ore-bearing, so that, with the exception of that which comes out of the shaft, no mullock has to be raised. The ore-bearing belt of strata is more or less vertical for about 300ft., and then underlies to the E. at a high angle. The veinstones associated with the copper ores are calcspar, sulphate of barium (heavy spar), and occasionally quartz. The rocks forming the ranges, which have an elevation of 2,000ft. above sea-level, consist of alternating strata, composed of quartzose sandstones and shales, siliceous and dolomitic limestone, clay, and calcareous slates and flagstones, sandstones, quartz, brittle shales, and kaolinised slates and sandstones. In the neighborhood of Blinman these strata form an anticlinal arch, owing to the intrusion of igneous rocks (greenstone, eurite, &c.) which appear at the surface in a few places. In the centre of the arch the strata are vertical, and have a N. and S. strike, while on each side they are inclined at various angles to the W. and E. It is in the centre of these disturbed strata that the copper-bearing strata in which the mine is situated occur. The supply of water is small but increasing, and is likely to increase as the

shaft is sunk deeper, and eventually a sufficient supply will be secured for concentrating purposes. A cross drive at right angles to and through the vertical beds would most probably increase the supply. (1890.) Mr. Masey, colonial director, supplied the following information for a former edition:—The value of the copper sold previous to the “seven years’ drought” (about 1874), when the mine ceased working, was £250,000. In 1881 it was re-started and worked to 1884, when the fall in the price of copper took place, the output at the time being from 80 to 100 tons of 23 per cent. ore per month. In the beginning of 1889 the mine was again started, and was put into thorough working order, the output being raised to 150 tons of 23 per cent. ore per month, which was sent to the Wallaroo Smelting Works. The ordinary ore raised averages 8 per cent., and is dressed up to 23 per cent., whilst that from the crosscourses and leaders, which can readily be separated by hand-picking, averages from 30 per cent. to 40 per cent. of copper. The number of men employed above and below, 80; expenditure in wages and general charges per month, £1,200. It may be added that whilst it is apparent, from the width of the stopes between the 50 and 70 fathom levels, that great quantities of ore were removed in former times, it is clear that there is no falling off in yield as the mine gets deeper; and I am of opinion that the strata will continue to be ore-bearing to a great depth, and that the mine is to all intents and purposes a permanent one.

Professor Geo. H. F. Ulrich, F.G.S., reporting upon this mine in 1872, speaking of the outcrop, writes:—

The deposit, as a whole, is bounded on the E. by bluish and mottled shaly slates, with a very steep E. dip, which changes, however, at a short distance further E., to about 30°. The rock on the W. side is not well exposed at the surface, but apparently consists of a calcareous, ferruginous, partly brecciated sandstone, striking N. 25° E., and dipping W. at an angle of about 50° at a short distance, N. and close E. of main stock; a great irregularity is apparent in the outcrops of the rocks of the country, calcareous shales and sandstones alternating The larger veins of ore traverse the stock mass at oblique, sometimes at nearly right, angles, but innumerable smaller veins run intermediately and join the lower ones from all sides, whilst the stone between is more or less strongly impregnated with ore. At 40 fathoms in depth, sulphide ore (copper pyrites) makes its first appearance, and increases in quantity down to the water-level at 50 fathoms, where, in the bottom of a large pit S. of engine shaft, a fine vein of rather friable but nearly pure copper pyrites was struck, that runs nearly E. and W., and is from 1ft. to 3ft. in thickness. In this portion of the mine the deposit . . . looks undoubtedly richer in ore than nearer the surface, the impregnation and veins of copper pyrites through the matrix reaching, perhaps, 20 to 25 per cent.

Besides the minerals already mentioned, the following occur in the deposit:—Azurite (blue carbonate of copper) rarely, in small specks near the surface; reddish and black cupriferous brown iron ore, in veins and patches; a black and muddy sulphide, coating copper pyrites; very little iron pyrites; galena, in small specks; heavy spar (sulphate of baryta), in nests and irregular veins, often finely crystallised; white calcite, in thin veins and nests; aragonite, in fine druses of needle-shaped crystals; quartz, in thin seams and small patches. On the slope of the hill, in close proximity to the deposit, the rocks also enclose small nests of micaceous iron ore.

Below the water level a vein of bisulphuret ore was struck, finely disseminated through magnesian limestone; depth of shaft, 70 fathoms. The ores obtained from the mine, from the surface to the 45-fathom level, were azurite and chalcocite, and from this level to the deepest point, chalcopyrite prevailed—pure iron pyrites being almost absent. At the 70-fathom level a series of vughs were discovered. (James, 1886.)

Mr. E. F. Cooke says “There is but one lode running N. and S., with crosscourses, and nearly perpendicular down to the 50-fathom level; from there to the 70-fathom about 1 in 5. The width of the lode ranges from 14ft. to 18ft. In the sulphurets leaders of solid ore gave about 28 per cent. of metal. The whole of the lode was full of veins of ore averaging from 2 per cent. to 5 per cent., and was capable of being dressed up to 25 per cent. The water level was slightly below the 50-fathom level. Drives to the length of 35 fathoms have been put into the carbonates on either side of the engine shaft. In sinking a winze below the 60-fathom level to meet the 70-fathom one, an immense vugh was discovered filled with water. The ore around this remarkable place is a rich sulphuret, and is coated with black oxide.”

During the period when the mine was being worked by the E. & A. Copper Co., viz., from 1882 to 1885, ore to the extent of 1,860 tons was smelted.

The Inspector of Mines reported that a strong lode runs through the property, which, besides maintaining an equal percentage of copper, makes at intervals extensive deposits of ore. Thousands of tons of carbonates must have been extracted formerly, and poorer places were left unworked because of lack of water for dressing and heavy cost of transit. But the water difficulty has been in a large measure overcome, and there should be produced 150 tons of 23 per cent. copper per month, besides 40 tons of 28 per cent. carbonates. The ore brings £8 per ton above Chili bar quotations, and the cost of transit to Wallaroo and smelting charges is £4 12s. per ton, making the mine payable even at the present low price of copper.—(1889.)

Recently the mine was let on tribute, and a fair quantity of ore was extracted. (1899.)

The Inspector of Mines, Mr. W. H. Matthews, reporting in February, 1906, says:—In the early days it was one of the principal copper-producing mines in the State, and continued so for many years, when, owing to the low price of copper and high returning charges, the original company discontinued operations. Since that time until about three years ago, the mine has from time to time been worked by tributers and others, and, with the most crude appliances, large quantities of ore extracted. Recently, or within the last three years, the property has been taken possession of by the Tasmanian Copper Company, Limited, and mining operations have been prosecuted vigorously and with the most satisfactory results.

Present workings are chiefly confined to the 50, 60, 70, 80, and 90 fathom levels: lode ranging from 12ft. to 25ft. in width, giving an average of about 17 per cent., returning as raised from $4\frac{1}{2}$ per cent. to 5 per cent. copper. In the upper levels the ore consists chiefly of green carbonates and red oxide; below the 50-fathom level this has given place to yellow and grey ore and a fair percentage of bornite, the latter shows very freely in the bottom, or 90-fathom, levels, which will probably be continued the full length of the main ore body, as shown in the levels above to be about 600ft. in length, of the average width stated, striking N. and S., with an E. underlie of about 45° . Throughout the workings there are numerous faults, breaks, and slides; in most instances where the faults occur the ore deposits are of a more valuable nature than in other parts of the formation. The character of the ore-bearing matter is principally siliceous limestone, sandstone, and quartzite of a very tenacious nature, so that very little timber is required, but to guard against any collapse of the workings large pillars of ore-bearing material are allowed to remain, which will eventually be extracted and yield good returns. For the future development of the property it would be advisable to continue the bottom drives the full length of the main ore body, ascertaining by crosscuts its width and value at various points, also continue the sinking of the main shaft on the underlie to at least another 100ft. Should these explorations prove as satisfactory as anticipated, the question of sinking a vertical shaft some considerable distance E. of the present workings might fairly be considered. By this means new ground would be explored, and large quantities of valuable ore remaining to support the workings could be removed and dispatched to the smelter, the profits of which would probably pay for a large portion of the suggested new work. The principal machinery on the mine is—one double cylinder winding engine, two blowers for furnace, with duplicate engines, one water-jacket furnace capable of reducing 170 tons per day, with ore-bins, tramlines, condensers, and other appliances necessary for the up-to-date working of the mine.

The usual output is about 10 tons of matte per day, containing 6 tons of fine copper. Usually there are from 250 to 300 men and boys employed, with a large number of horse teams and camels taking ore and supplies to and from the mine. General prospects are good, and are likely to continue so. (I.M.R., 6-2-06.)

BLOCK F, HUNDRED OF BATCHELOR.—Near Mount Young, in the hundred of Batchelor. The workings are situated on a small ridge, about 50ft. above the level of the plain. On the top of this, and striking in the same direction as the country rock, there is a considerable width of small seams of ferruginous quartz, containing green carbonates, azurite, and small portions of malachite. Several openings have been made on this, and one shaft sunk to the depth of 35ft., but in every instance after sinking through the broken country extremely hard rock was encountered, and the seams cut completely out, with no indication of making again. In places picked samples can be obtained, giving fair returns, but not in sufficient quantity to be of value, and there seems to be no indication of any lode at this place. (I.M.R., 30-7-01.)

BOOLOOROO SPRINGS LOCALITY.—About 30 chains E. of the gold workings copper ore of fair percentage was being obtained from two shallow shafts. The veinstone consists of soft claystone, carrying a network of small veins of quartz, copper glance, copper carbonates, and iron oxide. About 6 tons of ore had been sent away. (27-8-02.)

BON ACCORD COPPER MINE.—Adjoins the Burra Mine, a fact which influenced the adventurers. The indications of copper were slight, but a large sum of money was spent, and a considerable amount of work done. The engine shaft was sunk to a depth of 50 fathoms, and other shafts were sunk and drives put in. Some of the spoil raised was impregnated with particles of ore, amongst which may be detected red and black oxides. (Austin, 1863.)

BONAVENTURA.—A copper discovery on section 53, Copper Mine Creek, hundred of Cassini, Kangaroo Island. The show was worked by an Adelaide syndicate, which collapsed for want of funds, and it was abandoned. It is said that 40 tons of low-grade copper was raised, the highest return being 10 per cent. On a recent inspection the Government Geologist reported that no information could be gained as to the character of the lode, there being no surface indications, and the shaft being full of water. The country rock is clayslate, striking E. and W., with vertical dip. A fragment of ore from a refuse heap assayed $5\frac{1}{2}$ per cent. for copper; but his opinion was that no lode of any value was discovered, but possibly a small vein or bunch only.

BOOLCUNDA COPPER MINE.—Visited by the Inspector of Mines in 1899; it is situated about 20 miles N.E. of Quorn. There are several lodes and veins from 15in. to 4ft. wide. The work done at that time on Block 42 consisted of an open cut on the line of lode, 60ft. in length, and several small openings and one shaft sunk to a depth of 50ft. The copper-bearing material or lodes are continuous and well defined, and average from 15in. to 18in. in width, and consists chiefly of green carbonates and yellow ore. There is every appearance of a change taking place in the lode material. On Block 41 there are several small holes or shafts, from 10ft. to 20ft. deep, which have been sunk on parallel lodes having the same permanent appearance, but much larger, and ranging from 2ft. to 4ft. wide, with very fair veins and good patches of fair value of ore. The lodes strike N. and S., with a W. underlie of 2ft. in 6; they are very regular and well defined. The general appearance is very promising, and the ground should be further prospected by sinking a shaft W. of the line of lodes to a depth of at least 100ft., to intersect the lodes at that depth, where there is every chance of success. The same remark applies to Block 42, which should be explored below the water-level.

BREMER COPPER MINE.—Situated 36 miles S.E. from Adelaide, and close to Callington, near the Bremer Creek. It was discovered in 1850, and worked for several years; it was originally the property of the Worthing Mining Company, and was sometimes called the "Callington Mine." The surrounding country is flat, composed of clayslate, micaceous schist, and occasionally a little quartz. Mr. J. B. Austin reported that the prevailing ore is yellow sulphide, with black oxide; peacock ore is also found. The copper smelted at the works adjoining, during the time the mine was being worked, averaged 96 per cent. of pure copper, notwithstanding that the refining process was omitted. The mine was a part of the property

of the Britannic Mining Company. Towards the end of 1897 sinking to strike a copper lode at a depth of about 50ft. was commenced. It was said that some years previously a body of 30 per cent. ore was struck in that lode, but the insecure shaft collapsed. There are large bodies of mispickel (arsenical pyrites) in the mine, formerly thrown away on the spoil heaps, but now of commercial value.

In 1900 Inspector Matthews furnished the following report:—The old workings, which are situated on the S. portion of the property, have been untouched for many years, and consequently the underground portions could not be examined. Two lode formations are exposed on the surface; they are known as the Bremer, or main, lode and Boundy's lode; strike N.W., with a W. underlie of 2 in 6, and are composed of siliceous material, containing blue and green carbonates, yellow ore, and black oxide, occurring in veins and bunches. The enclosing rocks are principally clay slate and micaceous schist, with, for about 6 chains in width, veins of quartz, more or less copper-stained. The old records show that the main shaft on the Bremer lode has been sunk to the depth of over 600ft., and a large quantity of ore, giving high returns, removed; the lode at the bottom was from 8ft. to 12ft. wide, Boundy's lode is from 5 to 6 chains further E., and has been worked to a depth of 180ft., by two shafts sunk on its line. On the surface a strong quartz formation shows, but the copper contents are poor, so far as can be seen down the shaft. The operations in progress at the time of the inspector's visit were confined to the N. end of the property, on the supposed Bremer line, and a shaft had been sunk to a depth of 60ft., disclosing a strong ferruginous quartz lode, containing bunches and splashes of fair-grade ore, but not sufficiently good in bulk to be payable. Several drives and crosscuts at the 56ft. level had disclosed nothing of importance. For the future prospecting of this property it is advised that the lode and vein formations more towards the N. end and a little to the N. of the old workings should be thoroughly cross-trenched, and, at the most favorable spot, a fair-sized shaft sunk to such a depth as the influx of water will allow, and by crosscutting from one lode to the other probably many fresh veins will be discovered. The prospect is a fair one, and warrants the necessary expenditure. (I.M.R., 9-3-00.)

Operations were restarted in 1907, and a further report made by Mr. Matthews (Chief Inspector). This property is located towards the N. boundary of the township of Callington, and consists of 50 acres of freehold land. The present company has secured the mining rights for a period of 14 years, with the right of renewal from time to time, as may be required, with the exception of some small surface workings. Until recently, the mine has not been worked to any extent for the last 32 years, at which time it was in active operation, employing a considerable number of men, and had erected the necessary machinery and appliances, such as pumping and winding engines, together with smelting furnaces for the treatment of the ore raised.

Lodes.—Traversing the property there are two well-defined parallel lodes, about 280ft. apart, striking 30° W. of N., known as the Bremer and Boundy lodes. With the exception of the sinking of Boundy's shaft on the latter, all work done by the old company was accomplished on the former.

Bremer Lode.—This has an average underlie W. of about 2ft. in 6ft., and has been worked for a considerable length by a number of shafts sunk to various depths, and one main shaft 10ft. by 12ft. in the clear, timbered and centred in two compartments, and reaching the depth of 600ft., with drives opened out at each 60ft. level. Owing to the water standing within 50ft. of the surface, none of the workings could be examined; but from statements furnished to me by one that had worked in the mine at the time all work was suspended, it appears, from the surface down to the 540ft. level, a large amount of driving, stoping, and ore-extraction has been done for fully 700ft. in length. At the 600ft. level there is only about 40ft. of driving, leaving a large quantity of ore available for extraction, and it is stated that the lode at this point is 16ft. wide, returning an average yield of 14 per cent. copper. At that time copper was about £50 per ton, and the working and smelting expenses extremely large, hence the discontinuance of all operations.

Boundy's Lode.—Since the present company took the property over, all their operations have been confined to this line of lode. A pumping plant, with the necessary appliances, has been erected on Boundy's shaft, which the old company sunk to the depth of 180ft., and by the means of a crosscut connected it with the Bremer lode. The present pumping appliances are now raising 17,000galls. of water per hour, and have reduced it to the depth of 70ft. To drain the mine to a lower depth additional appliances will be required, but this has enabled operations to be carried on to a depth of 60ft. by sinking the shaft and other prospecting work.

New Shaft.—At a distance of 280ft. S. of Boundy's shaft a new shaft has been sunk to the depth of 60ft., and drives driven on the course of the lode 74ft. and 55ft. respectively. From the N. drive a rise has been made 20ft. in lode matter, and at present a small shaft is being sunk from the surface, which will eventually be connected with the rise, and give thorough ventilation. These workings throughout have disclosed siliceous lode matter ranging from 3ft. to 9ft. in width, probably giving an average width of from 6ft. to 7ft. From the surface down the character of the material consists for the first 30ft. chiefly of silica, blue and green carbonates of copper, and grey ore. This has given place to black ore, consisting principally of iron pyrites and black oxide of copper; apparently in the shaft bottom this has changed to yellow sulphide, as the last material raised contains small seams and splashes of yellow ore throughout the matrix, indicating that the shaft is nearing the sulphide zone, which I regard as highly important and encouraging, fully warranting the necessary expenditure in sinking the shaft to at least another 60ft.

Ore Raised.—The ore raised from the present workings is 100 tons, which has been dispatched to the smelters, giving an average value of $7\frac{1}{2}$ per cent. of copper; and about 50 tons of bagged ore on the mine, which the manager estimates will be of similar value. There is also a fair quantity of seconds on the floors, estimated to yield 3 per cent., which should eventually become useful as a smelting flux.

Machinery.—The present machinery on the mine comprises a double cylinder steam winch, Cornish boiler and vertical boiler, the latter being new, all being securely housed. The pumping appliances consist of a double-action Marsh steam pump. A new poppet head has also been erected, suitable for all present requirements.

Future Developments (Bremer Lode).—To further explore this portion of the property it would be necessary to erect a large pumping plant on the main shaft, and unwater the mine to the 600ft. level; but, as this with the necessary development work would be an expensive undertaking, that should not be attempted with a less capital than £10,000, I consider previous to this work being commenced it would be advisable to put down four diamond drill holes, with the object of proving the lode at the 700ft. level, or 100ft. below the present workings. By this means the size and approximate value of the ore body would be ascertained at a reasonable cost, and the truth of the statements made verified or otherwise.

Boundy's Lode.—For the purpose of further prospecting Boundy's lode, a second Marsh sinking pump should be placed in Boundy's shaft, and the mine unwatered to the depth of another 60ft. This would allow the new shaft to be continued to a similar depth, and prove the value and character of the material below the sulphide zone. This, including the purchase of pump, could be well accomplished on the expenditure of £600, which, from the present encouraging indications, would be money well spent. Six samples taken gave the following results:—No. 1, bottom air shaft, 24ft. deep, 10.8 per cent. copper; No. 2, new shaft, sample of black ore, from cavity in lode, 40.5 per cent. copper; No. 3, new shaft, sample of black ore then being dressed, 14.7 per cent. copper; No. 4, new shaft, sample of (seconds), screenings, 4.4 per cent. copper; No. 5, new shaft, sample of seconds, coarse, 1.6 per cent. copper; No. 6, new shaft, sample of seconds, coarse, 2.3 per cent. copper. (I.M.R., 1-8-07.)

BRINDANA (formerly "Paralana Gold Mine").—The copper shaft has been deepened to 30ft., and drives made from the bottom N.E. and S.W. for 20ft. each. About 14 tons of 33 per cent. copper ore was raised from the workings and picked from the dumps. (27-8-02.) Men on tribute now working on the mine. (4-3-04.)

BRITANNIA MINING COMPANY.—Established in 1849, and held 7,000 acres of land as a mineral special survey on the Bremer Creek. The operations of the company were confined to leasing sets of its land for mining purposes. In 1852 they had nine mines in active operation on this property, viz., the Wheal Friendship, the Wheal Maria, the Wheal Prosper, the Bremer, the Tresevean, the Menkoo, and three others.

BROUGHTON COPPER MINE.—Situated on the Broughton River, hundred of Andrews. The indications were very promising, and some rich ore was obtained, but the country was so hard that the venture would not pay for working, and after a few months the mine was abandoned. (Austin, 1863.)

BURRA BURRA MINE.—This property is situated in the hundred of Kooringa, about 100 miles from Adelaide, on bald hills standing 130ft. above the surrounding country; was found in 1845 by a shepherd named Pickett. The ores obtained from this mine have been chiefly red oxides, very rich blue and green carbonates, including malachite, and also native copper. (Austin, 1863.) The discovery of this mine, supporting, as it did at one time, a large population, marked a new era in the history of the colony. The capital invested in it was £12,320 in £5 shares, and no subsequent call was ever made upon the shareholders. The total amount paid in dividends was £800,000. After being worked by the original owners for some years the mine was sold to a new company, but during the last few years it has not been worked, owing in some degree to the low price of copper, and also to the fact that the deposits then being worked apparently became exhausted. For many years the average yield was from 10,000 to 13,000 tons of ore, averaging 22 per cent. to 23 per cent. of copper. It is stated that, during the 29½ years in which the mine was worked, the company spent £2,241,167 in general expenses, the output of ore during the same period amounting to 234,648 tons, equal to 51,622 tons of copper. This, at the average price of copper, amounted in money value to £4,749,224. The mine stopped working in 1877. In 1859 the number of men employed was 1,170. In the deeper levels regular lodes are met with, running N. and S., containing very rich ore of malachite, red oxide, and grey sulphuret of copper; but above the 30-fathom level there is no appearance of lodes, the ore (malachite and carbonate) being deposited with the greatest irregularity. The blue carbonate often occurred in round nodules, with regularly formed crystals projecting from the surface. The malachite was found in the form of stalactite, in slabs incrusting fissures, and irregularly shaped masses, which had been deposited in cavities of the rock. The country rocks are much broken and twisted, and consist of a cherty siliceous formation, crystalline white and grey limestone, blue slaty shales, and argillaceous sandstone. Just prior to the stoppage of the Burra Burra Mine, and whilst Captain Sanders was in charge, it is understood that good percentage ore was being obtained from a lode which had been opened at a comparatively shallow depth beneath the basin from which had been quarried the enormous yield of carbonate ores. For a number of years the mine has lain unworked, but recently an attempt has been made to recommence operations under the stimulus afforded by a much improved price of copper.

It having been decided to use the diamond drill for lode exploration, the Government Geologist made an examination with reference to the choice of a site for the bore, and access was given to the plans of the mine, and the reports of managers who were in charge before the mine was closed. These were incomplete, but evidenced that there are three main lines of lode, namely, Kingston's, Sanders', and Tinline's, which trended in a N.W. direction and inclined to the N.E., on the average 1ft. in 6. The richest part of the mine was found to be at a place where there is now a deep open cut. Here the lodes and small veins of ore intersected the country.

rock in all directions, and they were very rich in copper ore, chiefly carbonates. The depth to which this ground was worked was 60 fathoms. The ground containing these deposits was soft, and, becoming hard, the conclusion arrived at was that the copper ore had cut out. The deepest shaft, Morphet's, is down 100 fathoms, and in it Sanders' and Kingston's lodes have been cut, the latter being now in the shaft at or near the bottom. These lodes consist of a brecciated calcareous formation, containing calcspar, asbestos, steatite, quartz, &c., with peacock copper ore, as can be seen from an inspection of the spoil heap at the shaft.

The diamond drill bore (under Government supervision) was put down with the object of striking Sanders' or Kingston's lode at a depth on the inclination. The data used in determining the site of the bore was taken from the old mine reports. The bore reached a depth of 1,004ft., and entered a brecciated lode formation at 780ft. At 813ft. copper pyrites and quartz were observed in the core, and continued to occur for many feet below that depth. The drill continued in a similar lode formation, as above, for the remainder of the distance sunk. In the latter portion of the boring the core became fragmentary and not continuous, indicating the existence of vughs and cavities. This bore has proved that the copper-bearing lode mentioned in the last reports of the mine management as existing at a depth of 600ft. in Morphet's shaft, as well as in Waterhouse's and Peacock's shaft, is continuous in strike, and that it exists at a depth of 200ft. (200ft. deeper than it was proved in Morphet's shaft). The Government Geologist considered the result of this boring most satisfactory, because it proves the continuance downwards of the copper-bearing ground, and also that the recorded opinions and information of the mine managers are correct. He was also of opinion that enough data had been obtained by means of the bore to warrant the placing of Morphet's shaft in working order, and restarting mining operations from that point. A second site for boring has been selected near the S. end of the open cut, on or near the line of Tinline's lode, in the argillaceous rock, which is interstratified with limestone, the prevailing rock formation. (1899.) Mining operations have been resumed on a comparatively small scale, and Inspector Matthews reports:—An ore body has been discovered a short distance to the S.W. of the original explorations, by a small crosscut from the old workings, and Gall's shaft was started further W., in more solid country. This has been sunk to 75ft. At 60ft. a crosscut E. struck the ore body at 8ft. from the shaft; it was found to be about 10ft. wide, and consists chiefly of blue and green carbonates and lesser quantities of bornite. About 4ft. of the lode is high grade, and the balance fair milling ore; it has a more massive appearance towards the bottom of the crosscut than at the top, and is apparently the apex or cap of the formation, and depth should disclose ore of greater value and increased width. To further test the discovery, the sinking of Gall's shaft should be continued, a crosscut made W. from Graves' shaft, and a prospecting shaft sunk midway between the two. The prospects fully justify this. Four samples taken gave very satisfactory returns. Tinline's workings:—From the eastern side of the open cut, above water-level, a crosscut has been made E. 110ft., and drives extended, N. 40ft. and S. 120ft., on what is known as Tinline's lode, which does not appear to be a well-defined lode, but a formation of considerable width, consisting chiefly of argillaceous gritty sandstone, containing bunches of blue and green carbonates. Large quantities of ore were extracted from this portion of the mine in the early days, and there is no reason why similar results should not now be obtained from the unworked ground. (I.M.R., 30-3-04.)

BURRA CONSOLS.—Situated about 12 miles S.E. of the Burra. Towards the E. side of the property there are several small shafts, from 6ft. to 12ft. in depth, sunk on ferruginous outcrops from 2ft. to 4ft. in width, which in places contain bunches of green carbonate and grey ore. The veins underlie E. at a very flat angle, and the mining has been of the most crude description, merely following the bunches and shoots of ore wherever they might lead, and by this means about 20 tons, of the average value of 18 per cent., has been obtained. To prove the value of the

formations, three prospecting shafts should be sunk further E., to ascertain if the veins become more persistent, and the copper contents increase in depth. About half a mile further W., on the opposite side of the range, there is a large siliceous outcrop, containing copper stains for a considerable width. In one place a shaft has been sunk to the depth of 28ft., and 2 tons of 22 per cent. ore raised; but the bunch of ore gave place to extremely hard rock, and sinking was discontinued. To test this portion of the property, a prospecting shaft should be sunk at the most favorable point, to a depth of about 60ft., and then crosscut through the formation. (I.M.R., 19-10-99.)

BURRAWING MINE.—Situated in the hundred of Yaranyacka, near Tumby Bay. It was opened about 1871, and wound up in 1874. A good deal of work was done upon it, and ore to the value of £6,338 was sold; expended on the property, over £30,000. Assays of ore varied from 17 per cent. up to 37 per cent. of fine copper, and bismuth was present in the proportion of about $1\frac{1}{2}$ per cent. No work of any consequence has been done in the mine since 1874, and further information is not obtainable. Country rocks, micaceous and quartzose schist and slate. Prospecting operations being restarted, the Inspector of Mines, reporting September 4th, 1899, states that up to then the property had been unworked for 20 years. At the time of active operations the lode had been worked by a number of shafts, over a length of 12 chains; the deepest, or main, shaft being 275ft. from surface, and as it contained 165ft. of water, it could not be examined. From surface appearances the lode is fully 4ft. wide, containing green carbonates and grey ore, the enclosing rocks being micaceous and quartzose schist and slate. About 20 chains N. of the main shaft, a prospecting shaft was being sunk on the lode continuation, which here shows a kaolin formation of a very promising nature. During the time the mine was worked originally, copper ore was raised to the value of over £6,000.

BUNKER'S HILL COPPER MINE.—Situated S. of and adjoining Benalack's Mine, E. of Farina. Prospected by one shaft and several trial pits; the shaft is sunk to a depth of 20ft., and the lode formation, 18in. thick, consists chiefly of siliceous iron gossan, carrying rich nodules of grey ore. One of the trial pits is 5ft. deep, and exposes a vein 4in. thick, of rich grey ore. The inspector considered that this should be further prospected, as the prospects are encouraging, and the ground is inexpensive to work. (I.M.R., 22-11-99.)

CAMPBELL'S LEASE.—Situated $2\frac{1}{2}$ miles S.E. from Leigh Creek. The line of lode strikes N.W., and has been exposed for a length of 4 chains, by openings from 3ft. to 15ft. deep. The lode material shows for about 8ft. in width, and carries green carbonates. Three chains E. of the openings carbonates show on the surface, but the extent here is not yet known. Ten tons of 8 per cent. ore have been sent away; this could have been easily dressed up to a higher grade. The inspector considered the prospects of this property encouraging, and recommended sinking on the line of lode, with the object of testing it at depth. (I.M.R., 16-11-99.)

CALLANA COPPER MINE.—Locality, half a mile N.W. from the Dome Trig, on the Callana Station, near Hergott Springs. The Government Geologist reported an examination:—Several shallow pits excavated to prospect various outcrops of brown iron ore, gossan, limestone, carbonate of iron, and quartz, containing small bunches of copper ore. The outcrops broken and irregular, the country rocks having been twisted and contorted. No lode worth working yet (15-4-98) developed, the sinking being too shallow to be regarded as a test of the value of these small copper-bearing outcrops at depth. It is, however, doubtful whether a regular well-defined lode exists, owing to the disturbed character of the country rocks, though bunches of good ore may probably be found.

CARN BREA.—Situated in the neighborhood of Robertstown. A strong lode, composed principally of quartz, runs through the claim N.E. and S.W., underlying S.E. at an angle of 45° . The lode in the bottom of a 50ft. shaft is fully 7ft. thick, with excellent walls, but the proportion of copper is too small to pay. It is stated that gold has been seen in the quartz, but samples taken and tested did not show a trace. (I.M.R.)

CASTAMBOOL.—Located on section No. 330, hundred of Onkaparinga, about 12 miles from Adelaide. The present development or prospecting work is of a limited nature, being principally confined to small openings, and one inclined tunnel driven W. about 50ft., and drives driven a short distance N. and S., disclosing a strong body of siliceous material 4ft. wide, starting from the side of the range slightly underlying W. and rapidly dipping S., composed chiefly of quartz, containing in places small bunches and splashes of copper-bearing matter in various forms, such as malachite, blue and green carbonates, peacock and yellow ore of good value, but very limited in quantity. Possibly by continuing this work a larger quantity of ore-bearing material may be encountered, but at present the character of the ore bunches are scattered, and not consolidated or united at any particular point. About 200yds. S. of the present workings an old shaft has been sunk at the S. end of Pinkerton's Gully, on the same line of ore-bearing matter. This was abandoned on the discovery of the Victorian goldfields in 1851. These workings could not be examined, but it has been stated by old residents in that locality that the shaft had been sunk to a depth of 60ft., and a quantity of high-grade copper-bearing material extracted, bagged underground, and forwarded direct for treatment. Taking these statements as reliable, and to further prospect the property, it would doubtless be the most economical to sink a small shaft, say, 6ft. by 4ft., near the old one to the same depth, and at the level of the old workings, which have collapsed. By this means the ore body would be tested a considerable distance from the present workings, and the truth of the statements proved or otherwise. Four samples gave the following results:—From ore bunches face of inclined tunnel, 18dwt. silver, 5.5 per cent. copper; from ore bunches face of incline tunnel, 2ozs. 6dwts. silver, 8.9 per cent. copper; sample from small parcel dressed ore, 2ozs. 8dwts. silver, 18.6 per cent. copper; sample from small parcel dressed ore, 2ozs. 10dwts. silver, 16.6 per cent. copper. (I.M.R., 4-7-07.)

CENTRALIA (formerly "Smith's Olary" and "Olary Copper Mine").—A lode of copper was found in the Olary district in 1887. It strikes N.W. and S.E., and can be traced along the surface of the ground for some distance. An excavation has been made on a rubbly broken cap of the lode to a depth of about 10ft., and several tons of ore have been raised. Sufficient work has not been done to prove the value of the lode, but its appearance is very encouraging. The rocks with which it is associated are quartzite and quartzose sandstone and granite. (1887.) Locality, 7 miles N.E. from Olary Railway Station. The Inspector of Mines reported, October 29th, 1890, that a vertical shaft had been sunk to a depth of 140ft. on a large quartzite lode. At the base there was good sulphide of copper obtained from the lode at bottom of the shaft, and the lode at surface carries small quantities of copper. On the S.E. portion of the claim a shaft had been sunk in the lode to a depth of 60ft. Both shafts had so much water in them that an examination at depth was not possible. To the N. of this the lode is copper-stained, and a large lode of barytes outcrops N.W. In his opinion the property was worthy a further test by sinking and driving, with better surface appliances.

Inspector Matthews has furnished the following report:—Situated on a low granitic range $6\frac{1}{2}$ miles from Olary. The lode formation strikes N.W., and shows on the surface from 5ft. to 20ft. in width; it consists principally of siliceous matter showing copper stains in places, extending over about 500ft. in length. Several surface openings have been made, and two shafts sunk, one 60ft. and the other 200ft. deep; in the former drives have been made on the course of the lode, exposing seams and veins of good ore, from 3in. to 8in. thick. The latter, which is sunk on the S. portion of the most prominent outcrop, is in lode matter from the surface to the present depth, 200ft., the foot wall of the lode just appearing. The stuff raised from the bottom of the shaft contains yellow ore and black oxide; it is promising, but of low grade in bulk. At the 142ft. level a drive has been made N.W., disclosing veins of ore, from 2in. to 12in. in width occasionally making bunches considerably larger, containing sulphides and blue carbonate; above this level the

ore is chiefly blue and green carbonate, with a little ruby oxide. In the shaft, at a depth of 170ft., a vein of yellow and peacock ore was passed through, which gave excellent results; this is apparently near the hanging wall side, and to intersect it a crosscut should be driven through the lode from the shaft bottom, and then, at the most favorable point, drive N. and S. Three samples from the ore veins at 140ft. returned 33 per cent., 52 per cent., and 42 per cent., and one from the vein at 170ft. gave 34 per cent. The prospects are good, and the mine should be explored more vigorously. (I.M.R., 9-8-02.)

CHALLA.—A prospecting venture, started with a view of working on the W. extension of what was known as the Paramatta lode, near Moonta, and situate near to the Wheal James and Wheal Hughes mines. There was a good deal of costening done, and two shafts were sunk on the lodes to a depth of about 18 fathoms, when drives were put in 14 or 15 fathoms on a lode containing quartz, impregnated with mundic and streaks of yellow ore; but the lodes were not sufficiently productive to induce expenditure of capital, and, about 1870, the three sections were forfeited.

CHAMBERS' MINE (now named "Ben Lomond").—Situating 10 miles S. of Adelaide. In 1858 a magnificent block of malachite, weighing upwards of a ton, was reported to have been brought to Adelaide from this mine.

In March, 1907, the Inspector of Mines reports:—This property was formerly known as Chambers' Mine, located on the E. range of Coromandel Valley, 10 miles S. of Adelaide. The principal workings consist of two tunnels driven in the side of the range, which rises about 250ft. above the plain level. Lode formation ranges from 2ft. to 4ft. wide, consisting chiefly of strongly iron-stained quartz, striking E. and W., slightly underlying N. No. 1 tunnel has been started about 100ft. above the foot of the range, and has been extended about 150ft. on the course of the lode, which in the face is very much broken and disturbed, probably by a fault which has apparently taken place about 30ft. from the end, forcing the main ore body in a N. direction. At various points the lode contains copper stains to a more or less extent. From the bottom of the tunnel a winze has been sunk 55ft. Lode at the bottom has pinched very small, and is of little or no value. About 10ft. from the winze bottom a drive had been driven E. 20ft., disclosing vein matter 18in. wide; but samples gave very poor results. No. 2 tunnel is about 70ft. above No. 1, and has also been driven about 150ft., disclosing lode matter very much broken, and mixed with iron-stained gossan. At various points carbonate of lead and galena can be seen in nodular form, but taken in bulk is not remunerative. For the purpose of further development, a third tunnel has been started at the foot of the range on apparently the same formation, consisting of clay, sandstone, and iron-stained gossan, broken and disjointed. Probably, if this tunnel is continued in the more settled country, the formation will become more defined, and at a further distance of about 300ft. would thoroughly prospect the ground below the No. 1 and No. 2 tunnels; but, judging from the present developments in the upper workings, I am doubtful if the expense would be warranted. A much cheaper method would be to sink winzes from the bottom of each tunnel; then, should the lode prove remunerative, the bottom tunnel could be driven and connected with the winzes to facilitate the workings. Six samples taken gave the following results:—

	Gold.	Silver.	Copper.	Lead.
		ozs. dwts.	Per cent.	Per cent.
No. 1. Winze, No. 1 tunnel—Vein matter, 18in. wide	Nil	0 10	0·7	Trace
No. 2. From No. 1 tunnel—Vein matter, 8in. wide	Nil	0 8	3·2	Nil
No. 3. From No. 1 tunnel—Vein matter, 10in. wide	Nil	2 6	2·7	Nil
No. 4. From No. 2 tunnel—Selected sample, vein, 18in. wide	Nil	7 2	0·5	27·0
No. 5. From No. 2 tunnel—Selected sample, vein, 12in. wide	Nil	1 4	0·5	10·9
No. 6. From small winze, vein, 18in. wide	Nil	Nil	0·5	Nil

CHARLTON COPPER MINE.—This property belonged to the Australian Mining Company. It is situated on the Rocky River, and is 14 miles S.E. from Mount Remarkable. Twenty thousand pounds is said to have been spent on it without any return. There are two lodes, which yielded blue carbonates. The influx of water stopped the working in December, 1858. The mine was not being worked when Mr. A. R. C. Selwyn, Victorian Government Geologist, visited the district in 1859. He described the ore seen in the spoil heaps as consisting almost entirely of small nodular lumps of impure blue carbonate, embedded in a rough white rock, chiefly composed of decomposed felspar, with grains of quartz and a little mica. Several shafts were sunk.

CLARA ST. DORA COPPER MINE (TWO FRANKS).—Situated about 6 miles S.E. of Davenport Siding, on the railway line, and about 32 miles W. of Hergott Springs. The Government Geologist reported (7-10-95 and 22-2-97)—The workings consist of open cuts and shallow shafts. No. 1, 30ft. deep, with drives at bottom and excavations round it near the surface. The copper ore occurs in hard limestone in bunches, small veins, and vughs, and also in soft calcareous rock, associated with the limestone as copper glance, green carbonates, &c. There is every indication of its continuance downwards in that rock. No. 2 is a shaft 20ft. deep, in jointed grey limestone containing veins of rich copper ore. No. 3 is an open excavation to 26ft. in the deepest part, and 10ft. to 20ft. wide and about 40ft. long, in copper-bearing limestone, the ore occurring in irregular veins, streaks, and pockets. The excavation has proved ore-bearing rock 34ft. from E. to W. and 10ft. to 20ft. from N. to S. There is apparently a lode formation in the E. end and S. side of soft calcareous and argillaceous rock, containing veins of iron oxide and copper ore as carbonate, &c. Besides the ordinary copper ores obtained here, copper glance (rich sulphide of copper) frequently occurs, as well as red oxide and native copper. Similar deposits exist in several other parts of these blocks, and on the E. portion of blocks 313 and 314 small outcrops of copper ore show themselves, not yet prospected. From the fact of the limestone dipping vertically it will probably be found to contain copper to a considerable depth. The soft formation in No. 3 along the S. boundary of the limestone will probably be found to carry a defined copper lode. The ore raised has been of an unusually high percentage, and there is a large quantity of low-grade ore at the surface ready to treat when water is available. The earlier report mentions that 30 tons 4cwts. 1qr. of ore sent away averaged 39.25 per cent. In April, 1898, the Government Geologist again reported on this property. A main shaft had been sunk 90ft., and two crosscuts driven from it in a N. and W. direction. The W. crosscut, driven through limestone 41ft., had met with a lode formation containing bunches of copper ore, probably a continuation downwards of that in the open cut. The N. crosscut, driven 65ft., had not met with any ore. A new shaft had been sunk 30ft., 192ft. distant N.E. from the main shaft, through limestone containing bunches and veins of rich copper ore. A large quantity of dressing ore was lying on the surface. The work done had not yet proved or disproved the opinion previously expressed as to the character of the mine.

Operations in a small way have been carried on up to date, and the returns have been fair.

CLIVE COPPER MINE.—This mine is 4 miles from Nichol's Nob, and 40 miles from Lyndhurst Siding, on the Great Northern railway. In a fair proportion of the costeaning pits carbonate of copper was seen by the Inspector of Mines, and he came to the conclusion, from the general indications, that the claims comprise a strong cupriferous belt, from which large quantities of copper can be extracted at small cost. A shaft had been sunk about 40ft., and there is a strong lode showing fully 9ft. thick in places. The lode is composed of calcspar, carrying irregular branches or deposits of high-grade copper ore. At the time of the Inspector's visit there were about 30 tons of high-grade ore at grass. (1889.)

COCOANUT.—At a small station near Clinton, a copper discovery was made in 1865, ore lying upon the surface. Leases were taken out, but little work was done.

COGLIN, HUNDRED OF, SECTION 163.—The Government Geologist examined this copper find in 1896, and states that there is a lode outcrop consisting of quartz veins, gossan, siliceous and calcareous rock, and iron oxides, stained with carbonate of copper, and containing other copper ores. Where opened up the formation is 15ft. wide, and strikes N.E. and dips N.W., and is traceable along the surface for 2 or 3 chains. Deepest sinking, 30ft. Samples taken and assayed showed, respectively, 28½ per cent., 6 per cent., and 28½ per cent. for metallic copper. The country rocks are claystone and calcareous clayslate, with limestone bars. Well worth testing to a greater depth.

COLLINSY SPRING.—*Vide* OLADDIE, SEC. 45, page 106.

COMMONWEALTH MINE.—Situated in the Flinders Ranges, between Yudnamutana and Paralana, about 8 miles from the latter. Thirteen tons five hundredweight ore first raised realised gross value—copper, £170 5s., and silver, £56 13s. 11d. (27-8-02.) The mine is on a hill rising about 300ft. above the level of the creeks, and completely surrounded by high rugged hills. There are two large lode outcrops about 70yds. apart, one being about 5 chains long and 50ft. thick in widest part, and the other about 2 chains long. On the surface the lode matter consists of highly fractured quartzite, stained with copper carbonates, but a few feet below the surface it alters in character to a mullocky lode formation, containing felspar, heavy spar, quartz, mica, chlorite, micaceous iron, and ferruginous and argillaceous matter, stained with copper carbonates, and carrying seams and bunches of grey ore and heavy carbonate ore. Strike of lode N. 60° W.; true underlie not yet determined. Alongside the outcrop, and running parallel with it, is a dyke-like mass of granite (mainly pink felspar, with a little quartz). Several costeans and pits have been made on the large outcrop, and a shaft is in progress on the small one. (6-1-04.)

From the bottom of the shaft, 63ft., a crosscut has been made 61ft. N. 23° E. through the granitic rock, which proves to be ore-bearing, but not payable at this point. Four samples, giving average along the crosscut, returned 1.1 per cent. to 1.7 per cent. of copper and 6dwts. to 2ozs. 4dwts. of silver per ton, and one sample from a vein of copper glance and malachite, 1in. to 4in. thick, which occurs at 45ft. along the crosscut, returned 46.8 per cent. copper and 21ozs. 1dwt. silver per ton. The last 11ft. of the crosscut is in micaceous schist; the granitic ore-bearing rock shows a thickness of 50ft., less 9ft. total thickness of various hard bars of quartzite and heavy spar, running through it. It is suggested that the continuance of the lode matter exposed in the old workings lies to the S. of the present shaft. (George, 16-5-04.)

CONDELL AND PROVIS' CLAIM.—Adjoining the Flinders Mine, Tumby Bay. Worked by two shafts, 32ft. and 82ft. deep. The lode varies from 18in. to 2ft. wide; the ore, chiefly green carbonates, occurs in shoots and bunches. There are several small openings and shafts on the property, and in almost every case they show the lode formation, with bunches of ore. Six tons, worth about 12 per cent., sent to the smelters. Sample taken assayed 16½ per cent. Mine being worked on tribute. (I.M.R., 14-9-99.)

W. CONDELL'S CLAIM.—Situated 4 miles from Tumby Bay, on the Flinders line of lode. A cross trench, 5ft. deep, exposes a felspar formation containing small quantities of blue and green carbonates. Considered sufficiently encouraging for prospecting work to be continued. (I.M.R., 7-9-99.)

CONSTITUTION HILL COPPER MINE (also known at different times as the "Black Horse" and the "White Virgin").—This is situated about 4 miles S. from Mount Serle. It contains two outcrops of ore, which show on the N. slope of a low rise within about ½ a mile N.W. of the terminating point of a high spur connected with Constitution Hill. The first and most important outcrop represents a lode-like mass of a dense, brittle quartzite, which is thickly traversed in all directions by larger and smaller quartz veins, most of them, however, running in the strike of the mass. Both quartzite and vein quartz are full of small green patches, seams, and coatings of atacamite, and there are scattered larger vein-like masses and patches, which show

within an earthy atacamite envelope, nuclei of dark-grey oxide of copper, generally associated with calcite. This dark-grey oxide is very seldom pure oxide, but contains a variable percentage of sulphide of copper, and it is from the decomposition of this ore that it has most probably arisen. The outcrop extends for about 6 chains in length, showing a strike of N. 35° E., and apparently dipping steeply to the S.E. Its thickness is about 15ft. The second outcrop of copper ore lies about 1½ chains E. of the first, to which it shows great resemblance in mineral character. It is only from 1ft. to 2ft. thick, and is traceable on the surface for about 1 chain in length. The country between the two ore outcrops, and for some distance both E. and W., consists of argillaceous friable mudslates, which show between the outcrops a strike of N. 23° E., and dip E. at a very flat angle; further E. this strike is E. 35° N., with a S.E. dip of 40°. W. of the large quartz reef, more especially on top of the hill, the slates are traversed by quartz and ironstone or gossan reefs in great abundance, and large blocks of brecciated brown iron ore appear scattered over the surface. (Ulrich, 1872.)

The workings consist of an open cut, 66ft. long, 15ft. wide, and 12ft. deep, in which a shaft has been sunk 52ft. deep from surface. At the bottom of this a crosscut has been made 48ft., but discloses nothing of importance. About 2 chains N.N.E. from the shaft another shaft is down 21ft. on a formation consisting of quartz and argillaceous matter, carrying iron oxides and copper ore in the form of copper glance, ferruginous copper ore, and copper carbonates; it strikes N. 50° E. and underlies vertical. In the open cut the formation worked upon consists of much fractured quartzite, traversed by irregular small strings and veins of quartz and gossan, which carry copper glance and carbonate. The whole mass is more or less stained with copper. It strikes N. 35° E., and underlies nearly vertical to the S.E. The shaft was sunk near the foot wall side, and for 20ft. the sinking was through copper-stained material, but below that depth, and in the crosscut, no signs of copper are visible. Several other costeans and small pits have been made, but they disclose nothing of importance. About ½ a mile W., on the adjoining claim, a shaft has been sunk 35ft., and several pits and costeans made. The shaft and three other pits on the W. disclose kaolinised clay slate, carrying copper carbonate prill in appreciable quantity. The other workings have opened up on a quartz vein about 12in. in thickness, carrying copper stains and associated with gossan. (27-8-02.)

A further report states that No. 2 shaft, 21ft., has been deepened to 26ft. Another shaft, No. 3, 21ft. N. 50° E. from No. 2 shaft, has been sunk 66ft. No. 4 shaft, 26ft. deep, has been sunk 21ft. N. 50° E. from No. 3. These three shafts have been sunk in ferruginous and argillaceous matter, with small veins and bunches of quartz and heavy spar, the whole more or less stained with carbonates, and carrying occasional bunches of grey ore, ferruginous copper ore, and carbonates. The ground between shafts 3 and 4 has been stoped out to within 8ft. of the surface. In shaft No. 3 a head is showing at the bottom. This head was followed in sinking No. 2 shaft, and is probably the hanging wall of the formation. No foot wall has been disclosed. No. 5 shaft is situated 115ft. S. 36° W. from No. 2. It has been sunk 12ft., following a vein, 18in. thick, of heavily stained clayslate, with a little dredgy copper ore. This vein is not very well defined, but dipping N. cuts across the bedding planes of the country rock, which here consists of highly cleaved and jointed arenaceous and slightly micaceous clayslate, striking N.E. and dipping at a low angle S.E. (5-1-04.)

CONSTITUTION HILL COPPER MINE WEST.—This mine lies about 1½ miles W. of the hill. The ore indications occur in a lode of hard yellowish and reddish-white flinty limestone, and consist of thin veins and coatings of malachite and scattered specks of greyish oxide of copper. The lode is from 3ft. to 4ft. thick, and strikes W. 20° N., with dip apparently steep to the N. The country which the lode traverses consists of fissile purple slates, showing false bedding, and striking nearly due E. and W., with a N. dip of about 60°. These are succeeded, at 6 chains S., by grey calcareous slates. (Ulrich, 1872.)

COOPER'S CLAIM.—Situating N.W. from Walparuta Springs, Outalpa. Twelve tons, 8 per cent. copper ore raised from a shallow open cutting.

COPPER KING MINE.—Situating about 38 miles N.E. from Hawker. Three shafts have been sunk, from 15ft. to 45ft. deep; they disclose a lode formation from 2ft. to 3ft. wide, containing green carbonates and grey ore, associated with iron gossan. The lode strikes a little to the N. of E., underlies S. about 2ft. in 6ft., and can be traced on the surface for a considerable distance. Five tons of 28 per cent. had been sent away. Sample taken assayed $24\frac{1}{4}$ per cent. The prospects were considered very encouraging for the limited amount of work done. (I.M.R., 17-11-99.)

COPPER KING.—Situating about 10 miles N. of Beltana. The principal workings, claim No. 2171, are on a decomposed iron formation of great width, this is overlain by alluvial and clay slate containing nodules of copper throughout. Beneath it there is a vein of green carbonate, from 3in. to 18in. thick, resting on a band of decomposed iron. The copper vein is very irregular, in one portion of the workings dipping E., and in the other W., having every appearance of being the apex of the formation. An open cut has been made 40ft. long, with an average depth of 8ft., which, for the eight weeks preceding the inspector's visit, had yielded an output of 10 tons per week of 7 per cent. stuff. A bulk sample from the copper vein gave 4 per cent., and from the decomposed iron beneath, 3 per cent. There is good prospect of this property yielding large quantities of low-grade ore, which could be dressed up to marketable value, and, by sinking, other veins of greater value will probably be met with. With proper appliances a fair quantity of copper could also be extracted from the alluvial. (I.M.R., 6-12-03.) Returns for the six months ended December 31st, 1906, show net results:—17 tons 10cwts. 3qrs. copper ore, £295 ls. 10d.; 16 tons 9cwts. pigments, £47 19s. 1d.

COPPER TOP.—Situating near the Peake Station, about 8 miles from Warrina Railway Station. Lodes showing copper ore were found here; they were favorably reported on by Victorian experts; a company was formed in Melbourne, and smelters were erected at the mine. The operations, however, were unsuccessful, and the company went into liquidation. A return in April, 1903, states that 239 tons had been treated, averaging about 4 per cent., and that the deepest shaft was 125ft.

COPPER HILL MINE (KULPARA MINE).—The Inspector of Mines (Mr. W. H. Matthews), reporting on September 27th, 1905, states that the property is located 4 miles from Green's Plains Railway Station, and about 12 miles from Kadina. It was opened out in the very early days, and worked by a number of shafts of various depths extending for about 200ft. along the line of lode.

The main shaft has been sunk to the depth of 150ft.; in consequence of the water the lower portion of the mine could not be examined, but so far as could be ascertained, the first 90ft. of the shaft is vertical; at that point the hanging wall of the ore-bearing matter was encountered, and the latter portion of the shaft was continued on the underlie. In the bottom, or at the 150ft. level, a crosscut was driven S. about 12ft., with the object of penetrating the lode material and proving its value on the footwall side, but a much larger influx of water was encountered; the pumping appliances, which were of a very primitive nature, could not contend with it, and the property was abandoned.

Recently work has been resumed, principally that of ore-raising from the 66ft. level, and a large belt of ore-bearing material over 60ft. wide, striking E. and W. and underlying N., has been exposed. It is composed of friable, gritty, kaolinised matter, containing ferruginous veins and nodules of green carbonate, extending through the full width of the formation. On this, at various times, a considerable amount of work has been accomplished, driving in all directions without any system or regard to economical mining, and apparently a fair quantity of copper has from time to time been extracted. To re-open and further develop this property below the water-level it will be necessary to timber portions of the main shaft and erect machinery, probably for winding and pumping; then, at the point where the shaft

was sunk on the underlie, continue it vertically until the present depth is reached, or as much deeper as may be deemed advisable. By this means greater facilities, both for winding and pumping, will be afforded, and the work generally be in every particular more up to date.

From the general appearance of the lode matter at the 66ft. level it gives every indication of being the capping of a stony ore body, or lode, existing underneath the water-level—probably sulphides. This would be thoroughly tested by carrying out the works indicated, together with the necessary crosscuts and driving, say, at the 200ft. level. I regard this property as a fair mining venture which has very favorable prospects, and will fully warrant any expenditure that may be necessary in development. The following samples were taken from the dressed ore:—No. 1, 22.6 per cent. copper; No. 2, 22.5 per cent.; No. 3, 7.7 per cent.; No. 4, nodules of green carbonate 32.7 per cent. (I.M.R., 27-9-05.)

In a later report the inspector says that since his first visit to the mine a considerable amount of preparatory work has been done, such as a well-designed pumping plant consisting of Cornish boiler, horizontal engine, and 6in. diameter Cornish pump, also a very neat winding plant suitable for the work of testing the mine to a depth of about 400ft. Sinking of the main shaft has been resumed, and a depth of 250ft. reached. The ground being passed through is evidently lode formation consisting chiefly of quartzite, portions containing splashes and seams of yellow ore. (I.M.R., 14-12-06.)

COPPER HILL (Benowie).—Situated about 4 miles W. of Benowie Station. A large, irregular formation, consisting mainly of slaty rock, more or less copper stained, and showing malachite here and there, strikes W. 30° N. through country rock consisting of slate, sandstone, and felspar, across the top of a range rising about 300ft. above the level of the plain; it appears to have a slight dip N.E. For a distance of about 3 chains on the E. side of the hill it has been worked out to a depth of about 12ft., and, the bottom being all mullocked up, could not be examined; but it was stated that a good quantity of fair-grade copper ore was extracted by the previous holders. A rough average sample from the W. end of this cut assayed 4.8 per cent. copper. Three chains further W., along the line of strike, and just over the top of the hill, a small opening has again disclosed the copper-bearing formation about 3ft. wide. A little to the S.W. of the open cut there outcrops a large yellow brecciated, gypseous, quartzitic dyke, upon which a shaft has been sunk some 30ft. or 40ft., but there are no signs of copper in the spoil heap. The place, generally, is well worth prospecting, and the open cut should be cleaned out and sinking continued at the most favorable spot; also the opening near the top of the hill should also be sunk on. (D.R. (Gee), 16-11-06.)

COPPER VALLEY (KOOROONA).—This was a venture opened on the boundary of the Hamley Mine, with a view to discover the continuation of what was known as Bower's lode in the Moonta Mines, which had proved very productive. At a depth of 3 fathoms from the surface a lode was opened upon which was deemed well worth the outlay of capital, all the conditions being favorable; but on the collapse of the copper market in the "seventies" work was discontinued.

CORNWALL (NEW CORNWALL).—This is a mining property near Kadina which was believed to carry a continuation of two lodes that had been worked in the Wandilta Mine, near the Wallaroo Mines. As usual in discoveries in that locality, there was a show of green carbonates mixed with the nodular and loose gravelly limestone, and the adventurers were rewarded by lighting upon a fine deposit of grey ore and green carbonate of copper not far from the surface, and a large and beautiful specimen was sent for public exhibition. The adventurers went to great expense, importing a large engine direct from Cornwall, and sinking to a considerable depth for prospecting at that period and that locality. Operations ceased after a while, and nothing in the way of practical working was attempted on the property for some years. The Government Geologist reported, on September 15th, 1898, that no information could be gained respecting this property except from the

surface workings. There are apparently two lodes, running more or less parallel in a N.W. direction. These are strong formations of considerable width. The deepest shaft is said to be 360ft., and the water level is about 50ft. from the surface. The underlie is slight and to the S.W.

In April, 1907, the Inspector of Mines reports that the main shaft was said to have been sunk to a depth of 420ft.; but little or no reliable information can now be obtained as to the results, or why operations were discontinued. During the last two years the mine has been held and worked by Paull and party, who have confined their operations to the ground above water-level, with, so far as can be ascertained, satisfactory results. The surface workings have, apparently, disclosed a very wide belt of mineral-bearing country, consisting principally of decomposed gritty sandstone, containing bunches and seams of ore of exceedingly good value, chiefly in the form of green carbonates. Sample taken from these seams returned 47 per cent. copper. It is generally supposed that this belt of metal-bearing country is traversed by at least two or three lodes, running parallel, and probably are continuations of the same lodes that have been worked in the Wandilta Mine in the early days. Owing to the water, which stands about 50ft. from the surface, none of the lower workings could be examined; but, judging from the appearance of the waste dumps, which came from the deep shaft, there is no doubt that the workings had reached the sulphide zone, as yellow ore can be freely seen in the waste material. Recently there has been dispatched to the smelters 12 tons of crude ore, yielding an average value of 20 per cent. copper. Work in this mineral belt should be continued, when doubtless other valuable shoots or deposits of ore will be discovered. (I.M.R., 23-4-07.)

CRINNIS COPPER MINE.—This property is in the Angaston district. The lode is of an exceedingly interesting character. In the heaps of "spoil" that have been thrown out there were found specimens of native copper, blue and green carbonates, red oxides, sulphurets, and copper pyrites, also micaceous and magnetic iron ore, carbonate of iron, chalcedony, opal, and white crystalline limestone. The vein has an irregular N.E. and S.W. strike. (Selwyn, 1859.)

CUMBERLAND MINE.—This mine, about $1\frac{1}{2}$ miles to the S. of the Clinton Road and 11 miles from Kadina, belonged to the Wallaroo group, on Yorke Peninsula. What appeared to be a fine lode of very rich grey ore was found on the surface, but proved to be a blow only, and ran out in about 3 fathoms. Some fine galena was also similarly met with. Three shafts were sunk—one to the depth of 27 fathoms, and many fathoms of drives and costeaning were cut, but the lode could not be found, and the mine was abandoned. (Austin, 1863.) Operations restarted 1907.

CURRAMULKA MINE.—Situated in the hundred of Curramulka, Yorke Peninsula. There are traces for some distance of copper ore in calcspar, in the blue crystalline limestone, but there is no appearance of a lode, and nothing to warrant the sinking of a shaft (1864), although it is probable that there is a lode deposit somewhere near to account for the presence of such specimens as were obtained.

CURRENCY CREEK COPPER MINING SYNDICATE.—Locality of operations, about 4 miles from Goolwa, adjoining the Great Bradford. Two lodes, strike N.E., width 2ft. and 3ft. 6in., and shafts were sunk 10 fathoms, following dip of lode, and a drive put in 140ft. The ore is a red oxide; highest assay, 37 per cent. for metallic copper. Operations suspended for want of funds. A copper lode intersected the township lands, and specimens of blue and green carbonate brought thence to Adelaide created much attention at the time. (1848.) No work appears to have been done.

In May, 1907, the Inspector of Mines examined this locality and reported. This property is located $3\frac{1}{2}$ miles from Goolwa, close to the Currency Creek railway bridge. The land consists of freehold property, being the old township site surveyed in the early days. The mining rights of considerably over 200 acres have been secured by the present syndicate. In consequence of the bedrock being overlain with alluvial, ranging from 2ft. to 15ft. in depth, no lode outcrops are visible, and

little or no indication of metal except on the portion opened out, which was first disclosed on the bank of the creek by the action of the water cutting through the alluvial to the solid rock, a depth of 12ft. to 15ft., exposing copper-bearing material of good value. On this an inclined prospecting shaft has been sunk to the depth of 32ft. from the brace or about 42ft. from the surface, closely timbered to within 3ft. of the bottom. At this point the ore vein is apparently from 18in. to 2ft. wide, striking about N.E., with an E. underlie. On the footwall side the vein contains ore ranging from 4in. to 10in. thick, of exceedingly good grade, consisting of copper glance, azurite, malachite, and blue and green carbonate. Two samples from the shaft bottom returned 19 per cent. and 30 per cent. copper, and one sample of sorted ore gave 35 per cent. copper. Two other samples taken from ore raised and on the surface gave—firsts, 35 per cent., and a small parcel of seconds 13 per cent., which must be regarded as satisfactory. Owing to the little work accomplished, and the shaft being closely timbered, it is impossible to give a definite opinion as to the value of the discovery. At present it has a very encouraging appearance, and the shaft should be continued until water-level is reached, or as much further as circumstances will permit, then driven at each end to prove its extent and value. (I.M.R., 31-5-07.)

CUTAWAY COPPER MINE.—The Government Geologist examined this property, which is near Leigh's Creek, and found that there was a well-defined bedded lode, of a fair but varying width, enclosed by good walls; strike E. and W. dip S. The lode carries low percentage copper, which dresses up to 25 per cent. On the same claim there is a wide outcrop formation striking S.W. and N.E., containing carbonate of copper and grey ore. Sinking and driving should be carried on.—(See SOUTH AUSTRALIAN COPPER CORPORATION, pages 129 and 131.)

DALY COPPER MINE.—Situated about $5\frac{1}{2}$ miles E.N.E. of the Yudnamutana Mines, and the country to the S. and W. is, if anything, more broken, rocky, and wildly romantic than that in the neighborhood of the Yudnamutana. The workings, such as they are, are opened in a very strong mass of quartzite that runs at a strike of about N. 45° W. up the steep slope and along the top of a range which rises to a height of about 200ft. above a creek lying to the S.W. The ore is of a very good percentage, and consists of earthy, and sometimes crystallised, malachite and azurite, interspersed with patches and seams of red and grey oxides of copper. The quartzite is generally much fractured, rather brittle, and full of argillaceous veins, only in some places where the latter disappear it is very hard and tough, and traversed by veins of quartz, often finely crystallised and enclosing scales of micaceous iron ore. It extends, with two short breaks occupied by earthy conglomeratic shales, for about 25 chains in length, and shows abundant copper stains nearly all the way. The rocks of the district are of metamorphic character, presenting mica schist, hornblende schist, satiny and spotted slates, all of the same varieties as observed near the Yudnamutana Mine. (Ulrich, 1872.)

DEPOT CREEK.—Situated near Eyre's Depot. The general character of the lodes here is favorable to the production of copper ores of good quality. The lodes contain green carbonate of copper, grey ores, and red oxide. (1860-9.)

DEPOT SPRINGS (about 1 mile S.E. from).—An inclined pit, 20ft. deep and about 8ft. wide, with a trench at surface 20ft. long and 10ft. wide, discloses interstratified veins of specular iron, which carry small bunches of copper glance and ferruginous copper ore. They strike N. 20° E., and underlie S.E. at an angle of about 25° . About $6\frac{1}{2}$ tons of first-class copper ore was obtained in this working. The veins are small, and may not continue down to any great depth. About 9 chains N.W. from this working an inclined, irregular tunnel has been driven on a general bearing of S. 30° E., on what appears to be an interstratified lode formation about 3ft. thick, which carries irregular veins and seams of siliceous ironstone, with bunches of grey and ferruginous copper ore and a little cuprite. This formation strikes S. 5° E., and underlies to the E. at an angle of about 45° . A shaft has been sunk 35ft., and several shallow pits and costeans made, but nothing of importance disclosed. (George, 1-8-02.)

DEAD FINISH COPPER MINE.—Situating 1 mile from the Victory Mine and 18 miles from Leigh Creek. A formation, from 6ft. to 8ft. wide, has been prospected for about 3 chains in length by shallow pits and one shaft, 20ft. deep, exposing green carbonates of low value. It was intended to sink the shaft to 50ft., and then crosscut through the formation; this would be the proper course to adopt. Three and a half tons of 10 per cent. ore had been raised. (I.M.R., 30-6-00.)

DIAMOND JUBILEE COPPER MINE.—Locality, about 9 miles E. from Leigh Creek. The Inspector reported an examination of the mine, October 9th, 1890. A considerable amount of work had been done. There were two lodes; on the southernmost, shafts and trenches had exposed carbonates and red oxide of copper; and, at the base of a hill capped with quartzite, a tunnel had been driven 270ft., which had cut the lode. At the end of the tunnel a winze had been sunk to a depth of about 30ft., from which the lode should be tested. It has been stated that it is increasing in size at that depth. In October, 1897, it was reported the tunnel had been driven 285ft., and a lode 8ft. to 9ft. wide had been fully exposed. Samples taken from the 100ft. level gave as bulk returns—"Firsts," 30½ per cent., 32½ per cent., and 34 per cent.; "seconds," 19½ per cent. and 22 per cent. The ore was said to be free from mundic. A later departmental report states:—Two vertical shafts, 160ft. and 100ft. deep, were sunk, and a tunnel driven on a crosscut, and a formation met with, along which drives were made—W. 30ft. and E. 30ft. A winze was also sunk from the level, and drives made. The lode consists of quartz and argillaceous matter, carrying strings and bunches of cuprite, chalcocite, ferruginous copper ore, and carbonate; it varies from 2ft. to 8ft. in thickness, and is not very sharply defined. Strike E. and W., and underlie N. nearly vertically. Along the outcrop of the lode, just above the tunnel, a shallow open cut has been made, and copper ore obtained. About 1 chain further up the hill another similar lode outcrops. It strikes N. 70° W., underlies vertically, and has an average thickness of 3ft. An open cut has been made along this for a length of 40ft., with an average depth of 30ft., and a considerable quantity of high-grade copper ore removed. About 6 chains E. from the tunnel a shallow shaft and some surface costeaning have exposed a lode 3ft. thick, which consists of quartz and calcspar, with iron oxides, copper glance, carbonates, and ferruginous copper ore. No development work had been done for some considerable time, and three parties of men were then working on tribute. (George, 27-8-02.)

The mine has now been taken over by the Tasmanian Copper Company.

DOORA.—Situating a short distance S.W. from the Wallaroo property on private property. It was discovered through small pieces of carbonates being thrown up by burrowing rats. There has been a great deal of copper ore taken out, and the lodes are reputedly large, but the ore is of low percentage.

DUKE OF CORNWALL.—Situating about 6 miles from Kadina, on the Adelaide Road, and adjoining the Truro. Four prospectors joined fortunes, costeaning on a gossany iron outcrop to endeavor to cut the Cornwall lodes. The venture was unsuccessful.

DURYEA COPPER MINE.—Locality, about 1 mile S. of the Wallaroo Mines. It contained a great deal of ore requiring treatment by some cheap process. At the 12, 22, and 32 fathoms crosscuts and levels were driven, and two regular lodes, heavily charged with mundic, were found running nearly E. and W., and underlying nearly 18in. in the fathom. In the 32-fathom level a good course of rich yellow and black ore existed, and here the two lodes seemed to have run together. There is a good deal of black ore in veins throughout the mine, and some small branches of sulphide ore; but in several places patches of unproductive ground occur. (Austin, 1863.) Now included in the Wallaroo and Moonta property.

DUTTON'S MINE.—Situating 82 miles N. of Adelaide. It adjoins the Princess Royal Mine on the S. Work ceased in 1851; but in April, 1897, mining was resumed, and it was reported that a good lode had been cut, and a high-class ore raised.

EARL DALHOUSIE (JERRY'S) MINE.—Situated S.E. of Copper Hill, Kadina, and worked by Messrs. Levi & Watts, at the outset, on the strength of a discovery of green stains in stones by a shepherd in their employ. Two shafts and a number of costean pits proved to the proprietors that there was no payable lode.

EASTHER'S CLAIM (NORTHERN MONARCH).—Situated in the hundred of Cudlamudla. Four shafts were sunk, and drives were put in, but failed to disclose any courses of ore that would pay to work. The Inspector of Mines' report was that the picked ore bagged on the surface was worth only about 15 per cent., and, considering the smallness of the quantity obtainable and the lowness of the grade, there was scarcely an inducement to proceed with expenditure. Copper can be traced for a long distance on the surface on a N. and S. course.

EAST MOONTA.—A prospecting venture, near the Moonta Mine, intended to open on known lodes in the locality; but operations were not continued owing to the difficulty of providing capital when copper became depressed in value.

EDWARDS' COPPER MINE.—Locality, 19 miles N.N.W. from Quorn, on France's farm. The Inspector of Mines reported (1892) that a few small pits had been sunk in calcareous clay slates at various points where copper carbonates were seen. A shaft had also been sunk partly in an iron and maganese formation, but the property was valueless, neither pits nor shaft disclosing any ore of value.

EDELWEISS MINE (now called the "Edeberg").—On block 1, hundred of Apoinga, about 14 miles S. from the Burra. An irregular shaft has been sunk to a depth of 107ft. This was started on a vertical vein of quartz, striking N. 15° E., which in places is 12in. in thickness and in others shows right across the shaft. From surface down to 50ft. the quartz carries isolated nodules and small bunches of grey copper ore, with a little azurite and malachite. Vanadium, a rare and valuable metal, also occurs, intimately associated with the copper ore. The combination has been analysed by the Government Analyst, resulting in 48 per cent. copper, 12½ per cent. vanadium, 30 per cent. sulphur, with quartz and iron oxides, and named by him "Sulvanite." At 50ft. down the shaft the quartz vein appears to have altered in underlie, and dips out of the shaft to the W.; and between this point and the surface small quartz leaders leave the vertical vein and underlie also to the W. Short drives have been made at 54ft. and 64ft., but the copper and sulvanite appear to be confined to the quartz vein from 50ft. upward. The quantity is small; but drives put in along its course above this level may possibly disclose larger bodies of ore and shoots that could be followed downwards. (George, 4-7-01.)

The Inspector of Mines (reporting 26-3-06) states that the prospecting of these claims has been continued for a very long period, and a large amount of work accomplished by sinking various shafts ranging from 10ft. to 150ft. in depth, driving crosscuts, surface openings, and cross-trenches, extending on the line of lode for a considerable distance. In almost every instance vanadium can be seen occurring in small specks and splashes throughout the formation, but not in sufficient quantities to be of any commercial value, except towards the N. end of the workings, from whence, it is understood, the previous owners raised and shipped a small parcel to England, but with what result could not be ascertained. The principal work has been confined to what is known as the old and Northey's shafts. The old shaft has been sunk to a depth of 115ft., and cross-driven, disclosing a strong siliceous formation 20ft. wide, in places containing vanadium, but not of sufficient quantity to be of any value. Towards the upper portion of the shaft, or from the surface down to the depth of from 15ft. to 20ft., the metal shows much more freely in a vein from 12in. to 15in. wide, striking N.E. and S.W. Apparently the better class material is continuing in a N. direction, and should be followed. Northey's shaft is in the same block, and has reached the depth of 150ft., also crosscut driven in an E. direction about 200ft., apparently passing through the same formation disclosed in the old shaft, but not so pronounced,

it being difficult to distinguish between lode material and country rock; but at various points vanadium, in small spots, can be detected. A drive has also been made N. about 30ft., exposing the same class of material, of little or no value. On the W. wall of the formation there is a vein of pyrites material from 1in. to 2in. thick, striking in a diagonal direction to the main formation. It is intended to continue a drive S. until this vein is intersected, to ascertain if the value of the material will improve.

Vanadium being a rare metal of exceptional value, not hitherto discovered in this State, the shareholders have been fully justified in continuing their prospecting works. Unfortunately, up to the present, the lower workings have not shown the satisfactory result that surface indications would lead to expect; and until further surface or shallow level explorations have taken place, it would be advisable to discontinue operations in Northey's shaft and resume work in the N. end of the old shaft, where the vein discloses the metal more freely. By following this, more valuable vein matter may be discovered and more satisfactory results attained. Two samples taken from a small parcel of selected ore returned as follows:—No. 1, copper 10 per cent., vanadium 1.46 per cent.; No. 2, copper, 22 per cent., vanadium, 3 per cent.

ELSIE ADAIR.—Situated E. of and adjoining the Mount Coffin Mine. Worked by three shafts, each 50ft. deep, and disclosing a lode formation from 2ft. to 6ft. wide, containing veins and seams of green carbonates and grey ore. It has also been worked for about 6 chains in length. The strike of the lode is E. and W., with an underlie to the S. The general appearance is favorable and promising, and further development to the extent of sinking the shafts at least another 50ft. is warranted. (I.M.R., 4-12-99.) The Inspector of Mines on making a second examination in June, 1900, found that the deepest workings were then 100ft. from the surface, the shaft being sunk on the lode underlie of 2 in 6; there the formation is proved 5ft. wide, and carries bunches and seams of green carbonate and grey ore throughout the matrix, being more valuable in bulk and having a better appearance than in the upper levels. It was stated that during the last 11 months 140 tons of ore, average value 14 per cent., had been disposed of. (I.M.R., 29-6-00.) The copper-bearing formation is interstratified, and consists of soft clay slate, impregnated with green carbonate of copper; it strikes W. 7° N., dips S. at an angle of 48°, and varies in thickness from 4ft. to 11ft. A peculiar feature of this formation is the occurrence of small veins of quartzose grit, with iron oxide, a little grey ore, and green carbonate of copper, from $\frac{1}{4}$ in. to 3in. in thickness. They are apparently confined to the copper-bearing stratum, and occur in it at intervals at right angles to the underlie, with a dip of 13° to the westward along its strike. Where these floors occur good quality copper ore, assaying as high as 32 per cent., is met with. A main shaft has been sunk to a depth of 145ft. on the underlie, and levels and workings, from which ore has been extracted, exist at 30ft., 70ft., 100ft., and 114ft. About 500 tons of payable ore had been raised and marketed. (5-7-01.) A later examination showed the mine to be idle. A considerable quantity of ore had been raised by tributers. The quantity of arsenic contained in the ore makes smelting difficult. (George, 27-8-02.) The mine is now in work, a fair amount of ore being sent away.

EMU.—Situated between Wallaroo and New Cornwall Mines. Operations were commenced with the purpose of finding the spot where the lodes of the two mines junctioned. The test gave discouraging results, affairs were wound up, and the lease was forfeited.

EMU FLAT.—Locality, S.W. of the township of Clare. The vein opened is a mixture of quartz, carbonate of lime, and sulphate of barytes, in grey, white, and brown slate, and hard white calcareous and siliceous rock, and the ore, impure green and blue carbonates, mixed with sulphurets of copper and iron. Not much work has been done on it. (Selwyn, 1859.)

ENTERPRISE MINING COMPANY.—This company held various sections on lease and freehold, amongst others, section 5535, on the Sixth Creek; section 5607, on the Torrens; and section 267, adjoining Wheal Gawler Silver-lead Mine. On the Sixth Creek section ores were found comprising red oxide containing specks of virgin copper, grey copper, black oxide, and occasionally traces of blue and green carbonate. The company began operations in the spring of 1847, but its operations were limited.

ENTERPRISE (Beltana).—Situated $4\frac{1}{2}$ miles S. of Beltana, adjoining the Black Feather on the S. The lode outcrop is continuous for a considerable distance, and in one place is from 18ft. to 20ft. wide, with portions showing green carbonates. Two chains S. of this an open cut has been made 10ft. deep and 20ft. long, exposing on the E. side of the lode green carbonates and grey ore, which occur chiefly in bunches and veins. S. of the outcrop, and a little to the W. of the open cut, a shaft has been sunk to a depth of 60ft.; the lode material is siliceous ironstone, with pockets of fair-grade carbonates and grey ore. No driving has been done, and the lode is therefore unexplored. To develop this property a drive should be made N. from the 60ft. level in the shaft until underneath the large outcrop 2 chains distant. A second shaft should be sunk on the W. side of the outcrop, where a small opening has exposed copper-bearing lode matter sufficient to warrant further exploration, to be eventually connected with the drive. Sample from shaft assayed $9\frac{1}{2}$ per cent. (I.M.R., 5-12-99.)

THE ENTERPRISE (SLATTERY'S).—Situated 28 miles N.E. of Quorn, formerly known as Slattery's Mine. It had been unworked for several years, but during 1899 a considerable amount of prospecting had been done by surface openings and trial shafts, which disclose what is apparently a horizontal formation, the country rock being stratified, containing veins of siliceous calcite, associated with iron, iron pyrites, small quantities of green carbonate, red oxide, and spots of grey ore running between the joints or planes of the enclosing rock, with a slight inclination S. at the S. end, and apparently N. at the N. The ore occurs chiefly in smaller or greater patches, and is chiefly green carbonates, with isolated pockets of red oxide. The general appearance was not very promising, and the system of prospecting, viz., following almost horizontal veins, has not been the best to adopt. In order to test the actual value of the property, it is recommended that the most favorable points should be selected and one or more shafts sunk, passing through the surface or top formation, to ascertain if there are other ore-bearing veins below those at present worked, which are of too low grade to be profitable, notwithstanding the pockets that are from time to time obtained. Some years ago it was reported that a valuable gold discovery had been made in a siliceous ironstone vein in one of the surface trenches, but a sample taken by the inspector gave no gold on assay, and only a trace of copper. (I.M.R., 16-12-99.)

ENTERPRISE (Williamstown).—Situated on freehold property 2 miles from Williamstown. This was worked many years ago for a considerable time, and, so far as could be ascertained, several parcels of ore, from 28 per cent. up to 40 per cent., were sent to the smelters. At the time of the inspector's visit (March, 1900), operations had been restarted for about six months, during which time a winding plant and other appliances to facilitate working had been erected. A number of surface openings have exposed the lode for several chains in length; a main shaft had been sunk to a depth of 220ft., with drives at the 210ft. and 120ft. levels. In the latter a crosscut was made W. 80ft., and at 60ft. from the shaft the lode formation was encountered, striking N. and S., with an E. underlie of about 45° . The first 16ft. of the formation passed through is micaceous schist, containing no metal of any particular value. The remaining 4ft. is composed of a strong body of quartz material, with a copper-bearing vein on the footwall side, from 4in. to 6in. thick, containing green carbonate, yellow ore, and black oxide. On the course of the lode a drive has been made N. for 170ft.; the same body of siliceous material continues, with the ore vein as previously described. Apparently from

this level the previous company must have done a considerable amount of stoping both above and below the drive, and the inspector considered, from the appearance of the workings, that the ore vein, which seems to run in shoots with a N. dip, must have been much larger in places than it appears at present. At the 210ft. level the E. portion of the lode has entered the shaft; and a drive has been made 60ft. N. on the hanging wall side, the wall being clean, well-defined, and unbroken. The lode is composed of micaceous schist, containing cubical pyrites. It was intended to continue this drive 60ft. further N., and then crosscut W. to the footwall side to intersect the quartz lode and ore vein worked at the 120ft. level, which may be expected to continue downward, and of which the indications are favorable, the face containing detached blocks or boulders of siliceous matter, which, when broken, are found to contain high-grade yellow copper ore, giving the impression that the shoot of ore is being approached, and justifying the proposed work.

Samples from the ore vein at 120ft. level :—

Sorted ore silver, 15oz. 14dwt.; copper, 23 per cent.

Bulk sample silver, 10oz.; copper, 11½ per cent.

(I.M.R., 16-3-00.)

EUKO MINE.—This mine owed its discovery to burrowing rodents, just in the same manner as that heralding the Doora find. Costeaning, the prospectors found the back of a lode, which was found to be parallel to the lode in the North Yelta and S. of it. A shaft was sunk 22 fathoms on the lode, but a crosscourse at the 14-fathom level interfered, and the lode has never been discovered N. of it.

THE ETHIUDNA COPPER AND COBALT MINE.—Situated about 38 miles N.W. of Olary Railway Station. The surface rock is chiefly granitic, with bands of slate material, containing copper-bearing lodes and veins, four of which are exposed, traversing the property, three striking E. and W., and one N. and S. A shaft has been sunk on an underlie of 45°, to a depth of about 60ft., disclosing a formation 2ft. 6in. wide, composed mainly of ironstone gossan, containing blue and green carbonates, occurring in seams and bunches. At the end of the underlie a vertical shaft has been sunk to a depth of 50ft., but not being in repair, could not be examined. The lode outcrop can be traced for fully 4 chains in length; the enclosing rock is slate. The N. lode, which strikes E. and W., has been exposed by surface openings for 4 chains in length; the most E. opening has only the surface broken, and shows an encouraging prospect. Four chains further W. a trial pit has been sunk 6ft., but not enough has been done to determine the width of the formation; the ore vein shows from 12in. to 18in. wide, composed of blue and green carbonates of very fair value. About ½ a chain still further W. there is apparently a cross vein, which has been worked for a chain in length, and probably a fair quantity of ore extracted from shallow depths, but the workings being full of *debris*, little could be seen. On the surface the quartzite formation seems to contain pockets and bunches of ore for about 20ft. in width, and should be further tested by cross-trenching. About 3 chains S. of the N. lode, what is known as the centre lode has been opened in places for over 2 chains in length, the lode formation being of the most favorable character, from 4ft. to 5ft. wide, containing blue and green carbonates, with streaks of red oxide, and, in places, small quantities of grey ore. At one point an opening has been made to the depth of 15ft., from which a fair quantity of good-grade ore must have been obtained, the face having a very promising appearance; the enclosing rock is chiefly slate and sandstone. The S. lode, which is 13 chains S. of the centre lode, shows two veins, apparently parallel, with a strong bar of granite between. On the S. vein no work has been done beyond breaking a few surface stones, which show green carbonate. On the N. vein a shaft has been sunk to the depth of 50ft., the first 20ft. being vertical, the remainder on the vein underlie of about 3 in 6 N. At the bottom a drive has been made 38ft., the formation showing 2ft. 6in. wide, and the ore vein, 18in. thick, composed

of blue and green carbonates, the matrix being chiefly red oxide of iron. The high-grade ore occurs principally in shoots, with a W. dip. The E. drive is in 18ft., the lode formation at this point being larger, fully 4ft. wide. At the end of the drive a winze has been sunk 10ft., and at the bottom the ore vein shows from 12in. to 15in. thick, of very fair grade, and similar in character to that in the W. drive. The samples taken gave the following results :—

N. and S. lode.....	12½ per cent.
N. and S. surface opening	9½ “
N. and S. opening, 6ft. deep.....	7½ “
Centre lode opening, 15ft. deep.....	11½ “
Centre lode, red oxide, same opening.....	28½ “
S. lode, W. drive, 50ft. level	18 “
S. lode, E. drive, winze, 50ft. level	6½ “

This a very fair average taken in bulk, and the percentage per ton can be considerably increased by hand-dressing and sorting. It was stated that 8 tons of ore had been shipped to England, yielding 16 per cent. of copper and 4 per cent. of cobalt per ton. The outlook of the mine is very promising, and, notwithstanding the work done on it from time to time, is comparatively undeveloped, and should be further developed by sinking a main vertical shaft on the S. lode 4 chains W., and N. of the present workings, taking care not to intersect the lode at a less depth than 150ft. Its position would also be favorable for a water supply. The centre and N. lodes should be prospected by at first sinking prospecting shafts on the underlie of the veins. (I.M.R., 14-3-00.)

FEDERAL (Mount Bourne).—Situated about 14 miles N.N.E. from Leigh's Creek. The workings here consist of costeans, with shafts 30ft. and 40ft. deep. At the bottom of the deepest shaft the lode is 3ft. wide with 18in. on the hanging wall showing copper; average sample gave 12½ per cent. of copper and 6dwts. of silver per ton.

FEDERAL MINING CORPORATION (Lindschau and Warner).—One mile N. of the Hamilton Mine. On the top of a steep rugged ridge a large quartz outcrop 12ft. wide, striking E.N.E., shows splashes and bunches of green carbonate; an opening has been made 20ft. long and 8ft. deep, and at the foot of the hill a tunnel has been driven 70ft. It was expected that this would cut the ore body in another 20ft., and prove its value. (I.M.R., 2-8-99.)

FIEDLER'S CLAIMS.—Situated 3½ miles S.W. from Mount Lyndhurst. The principal work done is sinking of two shafts, 25ft. and 35ft. deep; the vein of ore is 6in. thick, and contains a large percentage of iron; 3 tons recently forwarded to the smelters gave a return of 9 per cent. of copper. Toward the S. end an opening has been made, 15ft. long and 5ft. deep, on a vein of green carbonate 18in. thick, and carrying small quantities of grey ore of much higher value than that raised from the shaft. An average sample from the vein assayed 28½ per cent., which appeared promising for future operations. (I.M.R., 3-8-99.)

FIFTH CREEK CENTRAL MINE.—Situation, about 8½ miles from Adelaide, hundred of Onkaparinga. The company acquired 147 acres by purchase, and, at the date of the Inspector of Mines' visit, had spent about £600 in mining operations. Ore sent to the Port Adelaide Smelting Works realised 11½ per cent. fine copper, and 45ozs. of silver per ton. The samples taken by Inspector Rosewarne for trial by the Government Assayer gave, per ton—No. 1, 5½ per cent. of copper and 85ozs. of silver; No. 2, 3½ per cent. copper and 6ozs. 11dwts. of silver; and No. 3, 4½ per cent. of copper and 28ozs. 15dwts. of silver; average, 5 per cent. copper, and 40ozs. silver. The ore could be dressed to 30 per cent. copper containing 240ozs. of silver to the ton. The constituents of the lode are gossan and oxide of iron, with blue and green carbonates of copper. The ore had been found in very limited quantities, but development would probably lead to the discovery of larger bodies.

In 1892 Inspector Parkes reported that the property consisted of 188 acres of freehold ; a tunnel had been driven 468ft., where it cut the main lode, drives had been put in E. and W., with total length of 600ft. ; at 35ft. W. from the end of the tunnel a winze had been sunk 90ft. The lode in the winze was 4ft. wide, carrying small branches of rich copper ore. No. 2 tunnel, higher up the hill, had been driven 145ft. N., cutting the lode, which was then driven upon 27ft. W. and 476ft. E., with a winze connecting with the No. 1 tunnel. No. 3 tunnel had been driven on the course of the lode E. 246ft., and a winze holed to No. 2. He was of opinion that the lode was valueless for silver, and that Nos. 2 and 3 tunnels should never have been opened ; effort should have been directed to deeper sinking and exploration for copper, the lode being stronger in depth than near the surface. A subsidy was granted by the Government for further prospecting, but satisfactory results were not obtained.

In June, 1907, the Inspector of Mines (Mr. Matthews) reported :—The previous companies had acquired by purchase 147 acres of freehold land, and from time to time have done a considerable amount of work in driving two tunnels, sinking winzes, and other developments, and, judging from the old records, with encouraging results. Apparently the mine when first opened gave exceedingly favorable assays for silver ; doubtless these came from the upper workings, which apparently have collapsed, and cannot be examined until reopened. The lower or bottom tunnel, which is about 190ft. below the hill top, is in fair condition, and has been driven 468ft., at which point the lode was intersected, striking E. and W., underlying N. at an angle of slightly over 2ft. in 6ft. Drives were then continued on the course of the lode E. and W. a total length of 600ft., and winze said to be sunk from the tunnel level about 130ft., penetrating the sulphide zone.

Owing to a portion of the drives having fallen in, and there being about 100ft. of water in the winze, only a portion of the bottom workings could be inspected, but there is quite sufficient to disclose a strong, well-defined lode formation, ranging from 2ft. to 5ft. wide, probably giving an average width of 4ft., consisting principally of soft, decomposed, friable, slaty matter, with gossan, calcite, and oxide of iron, enclosed within well-defined walls, giving every indication of continuing down to an unlimited depth. Throughout the formation there are small irregular seams and bunches of various classes of ore, such as blue and green carbonates and copper glance. In the winze, which had been unwatered to the depth of 30ft. below water-level, the lode formation maintains its full width and permanent appearance, but in the ore bunches the carbonates have apparently given place to splashes of yellow ore in the form of copper pyrites.

Samples taken yielded the following results :—No. 1 drive, 15ft. W. of winze, lode 18in. wide, 1oz. 2dwts. silver, 2·3 per cent. copper ; No. 2, drive 40ft. W. of winze, lode 5ft. wide, no silver, 1·9 per cent. copper ; No. 3, drive 60ft. W. of winze, lode 4ft. wide, 1oz. silver, 1·1 per cent. copper ; No. 4, opposite winze, bunch ore, 2ft. wide, 22ozs. 6dwts. silver, 6·4 per cent. copper ; No. 5, irregular bunches of ore from winze, 30ft. deep, 2ozs. 7dwts. silver, 5 per cent. copper ; No. 6, irregular bunches of ore from winze, 30ft. deep, 4ozs. 12dwts. silver, 6 per cent. copper ; No. 7, irregular bunches of ore from winze, 30ft. deep, 1oz. 4dwts. silver, 6·3 per cent. copper ; No. 8, small parcel sorted ore on surface, 7ozs. 18dwts. silver, 9·4 per cent. copper ; No. 9, small parcel sorted ore on surface, 3ozs. 14dwts. silver, 2·1 per cent. copper.

From the above samples it will be seen the lode contains more or less silver and copper, but in my examination of the workings which at present can be explored, I could see nothing of sufficient value to be remunerative. The better class ore, viz., the three samples taken from the winze 30ft. below the tunnel level, in regard to quantity, is so uncertain that it can only be regarded as an indication of what might take place at the deeper level in the sulphide formation. I was informed by one of the men who had previously worked in the winze that the ore

body had very much improved in the bottom, being solid, well defined, and containing a good percentage of sulphide of copper. To test this statement and further develop the property it would be necessary to unwater the remaining portion of the winze and continue the drives E. and W. on the course of the lode, with the object of proving its extent and value; then, if proved satisfactory, the necessary works could be established for its economical working. (I.M.R., 17-6-07.)

FULLARTON'S CLAIM (Eurelia).—Situated 1 mile from Eurelia township. Worked by a number of shallow openings and two small shafts, the deepest being 27ft.; these extend over $\frac{1}{2}$ a mile in length, and expose a clay slate formation from 2ft. to 4ft. in width, striking N. and S., with an E. underlie, and containing small streaks and veins of copper ore, chiefly green carbonate and grey ore, of good grade, but so disseminated through the matrix as to render dressing-up very difficult. Eighteen tons of $7\frac{1}{2}$ per cent. had been sent to the smelters, and a sample taken from the ore raised gave $7\frac{1}{2}$ per cent. The ore exposed is not sufficient in quantity to be payable, and the best prospecting to be adopted would be to sink on the underlie at one or more of the most favorable points, and test the formation at a deeper level. (I.M.R., 9-6-00.)

THE FLINDERS MINE.—Situated 4 miles from Tumby Bay. There are three lode formations traversing the property, each from 1ft. to 2ft. wide, the strike being about E. and W., with a slight S. underlie. The N. lode, on which the principal work has been done, is well defined, and a main shaft has been sunk to a depth of 210ft.; the lode formation carries a vein of ore, chiefly carbonate, 6in. thick, on the footwall at the 100ft. level. This was the lowest point that could be examined owing to a strong influx of water. The manager stated that the developments below are similar to those above, except that at the extreme bottom, 210ft., where the lode has changed to a sulphide material, from 2ft. to 3ft. thick, containing veins and bunches of good ore. The flow of water necessitated the suspension of all work below the 100ft. level at the time of the inspector's visit; consequently the real value of the discovery could not be ascertained, but from the small quantity brought to the surface the inspector was of opinion that the development was of a very encouraging nature. Driving and stoping were then being continued at the 60ft. and 100ft. levels, the ore, of the average value of 17 per cent., occurring throughout the formation in veins and bunches chiefly on the footwall side. The centre lode has only been prospected by a few trial pits, which expose the lode formation 18in. wide, showing, from material on the surface, traces of copper. The S, or No 3, lode has been worked by two shafts, 25ft. and 59ft. deep, and is composed principally of quartz material, containing blue and green carbonates, and occasionally a little grey ore. Five tons of ore, worth 25 per cent., have been sent from these workings to the smelters. The enclosing rock is very hard and difficult to work. About 50 chains in a N. direction from the main shaft a strong ironstone outcrop stands several feet above the surface; it strikes diagonally from the main lode, and to intersect it a tunnel from the foot of the hill has been driven in 133ft., through, chiefly, decomposed slate, and a considerable quantity of good iron ore is met with during the last 15ft. This tunnel should be continued, as it is apparently only just entering the main ore body, and the chances are that beneath such a large ironstone outcrop metals of some kind will be found to exist. Twenty-five tons of ore, of an average value of 15 per cent., have been sent to the smelters since the present holders have restarted operations, and another 10 tons of the same value was awaiting shipment. Sample taken by the inspector from the material raised from the shaft bottom, 210ft., assayed 23 per cent. (I.M.R., 18-9-99.)

FRIEND.—*Vide* PAULL'S CONSOLIDATED, page 116.

GLENALBYN MINING COMPANY.—Established 1850, to mine four sections a mile N.W. from Strathalbyn. Operations ceased in 1851, as a result of the exodus of miners to the Victorian diggings.

GRAND JUNCTION.—Situated between the Stanley and McDonnell Mines. The lode strikes N. 30° W., underlies S.W. at an angle of 58°, and, as far as opened up, varies in thickness from 1ft. 6in. to 3ft. Principal shaft, sunk to 62ft. (water-level) on the underlie; at the bottom, drives along the lode in progress both ways. Lode consists of micaceous iron, copper pyrites, and mundic; black oxide of copper is also present. Samples from the lode at this level assayed 19.4 per cent. and 3.7 per cent. About 300ft. N.W. of this shaft another shaft has been sunk to 32ft. on the lode, which consists of mullocky material, a little quartz, calcspar, heavy spar, and micaceous iron, with bunches of copper glance, ferruginous copper ore, and copper carbonates. The lode is persistent in dip and strike, has every appearance of permanency, is fairly rich in copper, and should be opened up systematically. (7-1-04.)

GORGE COPPER MINE.—Two miles S. of Normanville, on the face of a steep hill rising almost abruptly from a flat $\frac{1}{2}$ a mile from the sea. The lode runs N.N.E., and is traceable for above 250yds. On the surface it is composed of a quartzose rock, strongly stained and impregnated with blue and green carbonate of copper, and contains thin veins of ore. (Austin, 1863.)

The Inspector of Mines reported (11-2-91)—An adit had been driven into the hill 180ft., cutting a lode with a strike E.N.E. and W.S.W., upon which a drive was put in 20ft., alleged to have holed into a shaft from top of a hill. At the end of the adit a winze had been sunk, from which it was stated that nodules of copper pyrites had been obtained. Enclosing rock, micaceous schists. He could not report favorably. About a $\frac{1}{2}$ of a mile W.S.W. an underlie shaft on the footwall of the lode had been sunk 20ft. There were indications of copper.

GREAT BENOWRIE COPPER AND SILVER MINING COMPANY.—Situated 16 miles from Mingary Railway Station. The secretary (Mr. O'Connell) states that the property taken up by this company was 1,800 acres of Crown lands, and contains about 10 lodes, with strike E. and W., and a width of 5ft. One shaft had been sunk to a depth of 100ft., and a drive had been put in a distance of 20ft., the country being granite. The ore readily dressed up to 20 per cent. The company went into liquidation. (1899 edition.)

GREAT BRITAIN.—This copper mine is situated on the seashore at Port Wallaroo. A shaft was sunk just above high-water mark, and a strong lode found. In rough weather the high tides damaged the workings, and the directors were unable to make provision against this difficulty. The mine is full of water and, in 1890, had remained so for some years.

GREAT BOULDER.—Situated about 16 miles from Wooltana Head Station, on a range rising abruptly fully 250ft. above the plain level. The outcrop of the formation shows strongly, and is in places of great width. It has been opened out on the surface by various cross-trenches for a length of 150yds., the strike being N.E. and S.W., with a W. underlie. Towards the N. portion of the workings a shaft has been sunk to a depth of 40ft. on the underlie, footwall side, exposing siliceous lode matter over 4ft. wide, carrying a vein of copper-bearing material from 18in. to 2ft. thick, containing copper glance, azurite, and malachite of very high grade. The copper-bearing shoot is apparently dipping S., as at the bottom the copper contents are of much less value, showing that the shaft has passed through the richer portion. About 1 chain N. of the present workings the lode has been opened on the surface, disclosing a very encouraging prospect of green carbonate; this has the appearance of being a second shoot of ore striking in the same direction and beneath the other, but this can only be determined by either sinking the shaft deeper or continuing the work at the N. end, and the former would be the best course to adopt.

Samples taken from the drive assayed:—

Dressed ore, No. 1.....	6dwts. silver	41 per cent. copper.
“ No. 2.....	6dwts. “	34 “ “

(I.M.R., 5-7-00.)

No. 1 shaft sunk 82ft.—45ft. vertical and then 37ft. on the incline of the lode; No. 2 shaft, 25ft. on the incline, following a quartz lode $4\frac{1}{2}$ ft. thick, which carries bunches and nodules of siliceous low-grade copper ore. About 50ft. S.W. along the outcrop an inclined stope about 70ft. long connects with the vertical shaft at 32ft. from the surface. This has been made on a vein of rich grey copper ore, striking N. 54° E., dipping at an angle of 60° to the N.W., and varying from 6in. to 3ft. in thickness. The ore occurs in a mullocky lode formation, with quartz, and in the inclined stope a small vein of quartz and earthy iron oxide about 1in. in thickness strikes irregularly at right angles to the lode and dips along it S.W. at an angle of 23° . This appears to act as an indicator, as, where it intersects the lode, the copper ore occurs above and below it. About 3 chains S.W. from these workings a lode of quartz, heavily stained with green carbonate, strikes N. 54° E.; it carries a little grey ore in nodules. To the S.W. of this is a bed of siliceous slate, heavily stained with blue and green carbonate, and showing crystals of azurite and malachite in the cleavage joints and crevices. (George, 5-7-01.)

A further report states that at 32ft. in the shaft a drive has been put in S. 65° W. for a distance of 40ft., and at the end a winze put down for 10ft. No ore showing, and it seems to cut right out a few feet S.W. from the shaft. At the bottom of the shaft, 82ft., a crosscut has been put in 18ft. N.W., but disclosed nothing of value. Open cuts and surface prospecting, at places previously mentioned, have only disclosed small and irregular seams and bunches of green carbonate, associated with iron oxide. (George, 27-8-02.)

This now includes the Welcome Mine, *vide* page 147.

GREAT GLADSTONE COPPER MINE.—Situated 32 miles E. from Port Augusta, on the slopes of low hills lying to the E. of Mount Brown. The country consists of clayslate and quartz. There are several outcroppings of ore, and the backs of the lodes consist chiefly of ironstone, but there are fine specimens of rich copper ore, grey oxide and brown ore, besides green carbonates and a little malachite. Small particles of galena were also met with. Three shafts were sunk, varying from 8 to 17 fathoms in depth, and drives were put in for some distance. This mine is rich in specimens for the cabinet, the crystals of quartz stained with copper and other metals being very beautiful. (Austin, 1863.) The Inspector of Mines reported in March, 1890, a shaft had reached a depth of 100ft. going down between two iron lodes, the gossan being argentiferous, sometimes yielding 500zs. silver to the ton. The shaft should, with such a good prospect, be sunk to a much greater depth, as the two lodes might unite and prove valuable for silver.

GREAT MOUNT LYNDBURST (also known as "Clark's Mount Lyndhurst").—Lies about $1\frac{1}{2}$ miles E.N.E. from Mount Lyndhurst Trig., on the top of a steep hill that rises about 120ft. above the adjacent gully. The copper ore occurs here in a number of closely adjoining gossan and quartz veins, which vary in thickness from 1ft. to 8ft. These cross light bluish flaggy, more or less concretionary, arenaceous slates at a strike of N. 45° E., and dip N.W. at 40° to 45° . In the walls of these veins and in the less regular hanging walls there seem occasionally to occur pockets and irregular veins of brown iron ore and grey oxide, intimately impregnated with chloride and carbonate of copper. The ore, as seen in the heaps on the ground, is of rather poor quality, consisting of a breccia-like mixture of concretionary gossan and quartz, impregnated with chloride, carbonate, and grey oxide of copper. The country lying between Barilla and Mount Lyndhurst, and for several miles N., presents quite an auriferous aspect, and well deserves to be prospected for gold. (Ulrich, 1872.)

Inspector Parkes (October 6th, 1890) reported that there were several shafts and pits on the property, all in bad condition. There was nothing like a lode showing on the surface, but he saw small segregated veins crossing the strata not worth developing. Again he inspected the mine (August 27th, 1895), and found that a shaft had been put down 50ft. on two small segregated veins, composed principally of chalcolite, with small deposits of atacamite; strike, N. 20° E., with dip N.N.W.

Two other shafts had been sunk, one 22ft. deep having a small but rich vein of copper. In No. 5 shaft, 15ft. deep, is a strong vein carrying small bunches of chalcolite equal to 50 per cent. copper. Ore to the value of £355 has been sent away, and some was ready bagged.

The Government Geologist examined it in 1897, and reported that there are numerous old shafts and cuttings on the various parallel lodes extending E. and W., and dipping N. The present workings consist of an underlie shaft sunk on a lode with good walls striking N.E. and dipping N.W. at 45°, in slate and claystone. The old workings, it is said, were carried to a depth of 100ft. only. The prospects of obtaining ore are good.

The principal workings consist of a number of small shafts and openings on three lode formations, which run from 2ft. to 5ft. in width, composed chiefly of shaly slate, containing seams of quartz, coated with silicate of copper, and occasionally nodular bunches of rich copper and malachite are met with. Sample taken assayed 35½ per cent. of copper. In the mineral claims, ½ a mile to the W., several small shafts and openings have been made, the deepest being 15ft., without exposing any regular lode. The formation is soft decomposed slate material, containing bunches of green carbonate scattered throughout. The copper-bearing formation appears large, and of a very promising nature, and one or more shafts should be sunk to at least 100ft. in depth, and crosscuts driven, when probably more continuous veins will be met with. Work has been in progress on the mine for a considerable period, and 120 tons of ore, averaging 30 per cent. of copper, have been sent to the smelters. (I.M.R., 3-8-99.)

A departmental report dated June 8th, 1902, states that the main workings disclose four approximately parallel lode bodies, which strike about N. 40° E., and underlie about 50° N.W., and upon these seven shafts have been sunk. Going from the main workings along the top of the hill, 14 outcrops are crossed in a distance of 18 chains, all more or less stained with green carbonate, and worth prospecting. About 3 chains E. from the main workings what appears to be an interstratified lode formation has been exposed by a pit about 4ft. deep. It consists of ferruginous argillaceous and siliceous material, stained with green carbonate. The thickness has not been determined, but in the pit it shows over 3½ft.; this is worth further prospecting. The lateral extent of the shoots of ore in the main workings has in no instance been determined. The system of working the property hitherto has been to sink a shaft to a depth of 30ft. or 40ft., and to stoep out the ore for a few feet on each side, then abandon the working and start a new shaft. No attempt has been made to sink to any depth and open out on the lode.

The account sales of copper ore obtained from the mine between September, 1892, and May, 1902, show that 160 tons 16cwts. of ore, of a gross value of £2,434, were sold. This is regarded as very encouraging, taking into consideration the low price of copper obtaining during most of the period and the small amount of ground that has been opened up to procure this ore.

About ½ a mile W. from the main workings two shafts, 45ft. and 30ft. deep, and numerous pits and costeans have been sunk over an area of about 2 acres in a soft, whitish-colored slaty formation, which contains small irregular veins, bunches, and nodules of grey ore and carbonate. At the bottom of the 30ft. shaft a little stoping has been done, leaving a chamber which discloses a network of small veins from ½in. to 4in. thick, consisting of ruby oxide, grey ore, and malachite. Ore was obtained in every pit and costean put down, and further prospecting in the locality is advisable. (George, 8-6-02.)

GREAT MONTEZUMA.—Locality, E. of and adjoining the Flinders Mine, Tumby. Under date November 18th, 1898, it was reported that a securely timbered shaft was down 82ft. on a well-defined lode, 2ft. wide, strike E. and W., and dipping S.W., and carrying high-grade black oxide and green carbonates. A second shaft, 50yds. E., had proved the lode down to 32ft. 6in., and the width was found to be from 2ft. 6in. to 3ft., carrying rich grey ore, intermixed with chlorides, &c.

GREAT WHEAL ORFORD (Reedy Creek).—*Vide* KITTICOOOLA, page 70.

GREAT COPPER BELL.—Situating about $2\frac{1}{2}$ miles S.W. from Parabarana Hill. A shaft has been sunk to a depth of 95ft., and drives made W. along the lode at 30ft. and 50ft. from surface for 6ft. and 12ft. respectively. At the bottom of the shaft the walls are well defined and about 15ft. apart, carrying between them four veins of copper pyrites and black oxide of copper. The vein on the footwall is about 2in. thick, and consists principally of black oxide, then a vein of quartz and copper pyrites 6in. thick, next another similar vein 12in. thick, and, on the hanging wall, about 3in. of black oxide. The veins are separated from each other by soft argillaceous mullock, of which the remainder of the formation is composed. In the drive at 50ft. the walls are 6ft. 6in. apart, enclosing about 3ft. of quartz, 4in. of which carries good copper ore, and about 2ft. 8in. carrying a little copper, balance, 3ft. 6in., consists of mullock. At 30ft. the walls are 5ft. 6in. apart; on the foot wall about 18in. of copper-stained quartz, with small bunches of carbonate. About a chain W. another shaft, 35ft. deep, has been sunk on the lode, which averages 6ft. in thickness and consists of quartz with copper carbonates. The lode strikes N. 70° W., and underlies almost vertically to the N. The country rocks consist of gneiss and binary granite. Owing to the dryness of the season the property was not being worked. (George, 27-8-02.)

A recent inspection showed that this promising show was abandoned and that the shaft had fallen in. (4-3-04.)

GREEN AND GOLD.—This mine is situated about 10 miles E.N.E. of Olary Railway Station, and possesses a large lode formation of siliceous iron ore, containing a lode of copper pyrites and carbonate of copper about a foot wide. The walls consist of micaceous schist and micaceous granite with garnets. The lode strikes E.N.E., and an excavation made showed an increase in thickness. The rock formations are metamorphic granite, gneiss, and mica schist, with dykes of eruptive granite. Near the surface coarse gold was said to have been frequently seen in the copper, and fine gold can be obtained by crushing the gossan found in one of the lodes. There are quartz outcrops on the neighboring hills, which should be prospected for gold. (1889.)

GREEN HILL.—Situating about 3 miles N.E. of the Appealinna Mine. The location is a rough, rugged hill, standing 200ft. above the level of the plain. There is no appearance of any defined lode, but it is simply an enormous mass of country rock impregnated with copper stains. In places there are bunches of good ore, consisting of purple and green carbonates, also occasional patches of grey ore. Several openings from 2ft. to 10ft. in depth have been sunk, and in most instances the copper has cut out. There are, however, favorable points which should be tested by small prospecting shafts, and, if successful, a main tunnel would thoroughly test the value and facilitate the working. Samples of sorted ore broken from the surface openings assayed 32 per cent. and 7 per cent. of copper. (I.M.R., 24-11-99.)

GRUNTHAL MINE.—Situating about a mile N. from the township of Grunthal. There are two shafts, both nearly full of water. On the surface there are several buildings, including an engine-house. The veinstone raised consisted of quartz, calcspar, and gossan, with iron and copper pyrites. The country rocks are clay slates and argillaceous sandstones, dipping E. The locality is a likely one for gold. No information received concerning the past working of this mine. (1887.)

GREAT NORTHERN (TWO BROTHERS) MINE.—Fourteen miles N.N.W. from Blinman Mine. A fair amount of work was done about 40 years ago. A lode of micaceous iron and argillaceous mullock strikes N. 30° E., and underlies N.W. at an angle of 40° . It has been exposed over the crown of a low hill, for a distance of about 9 chains along its course, by short tunnels and open cuttings. It varies from 1ft. to 3ft. in thickness, and carries small isolated bunches of copper glance, ferruginous copper ore, and carbonates, and was mined principally for flux for Sliding Rock smelters. The footwall, though ribby, is smooth and sharply defined, but no hanging-wall has been met with. The country rocks are banded slate and fine quartzite, striking S. 35° W., underlie S.E. 30° . (George, 27-8-02.)

GUM WELL.—Situated about 56 miles E. of Petersburg, 2 miles W. from Gum Well Station. This is an old mine with an open cutting, 30yds. in length and 10ft. deep, and a shaft about 40ft. deep. In the cutting a quartz and ironstone reef is disclosed, carrying copper ore. The strike of the reef is E.N.E. The rocks are black and bluish calcareous slates and fine-grained slaty sandstone and limestone. (1885.)

GURR'S COPPER VENTURE.—Situate on the Oopina Run, 8 miles N.W. from Waukaringa. The Inspector of Mines reported, in February, 1891, that a shaft had been sunk 20ft., cutting a small vein of ferralcite carrying a little carbonate of copper. From the vertical shaft an underlie had been sunk to a depth of 67ft. At about 300ft. W. another shaft had been commenced. Vein small and poor.

HAMLEY MINE (KARKARILLA).—This forms one of the Moonta group, on Yorke Peninsula. In the first instance (1861) a small company subscribed 20 shares, taking up seven sections W. of Moonta Mines. Afterwards the present property was secured. In March, 1862, ore was cut where the engine-shaft now stands, and a second shaft was sunk. Carbonates and black and yellow ore were discovered at 17 fathoms, and then nothing of value until the depth of 40 fathoms was reached. The mine shortly afterwards stopped work, but very soon a reconstruction under the present name led to a renewal of operations, with successful results. The veinstone associated with the metallic minerals is quartz and felspar, and the country rock is hard and close. The quantity of ore raised (February, 1887) equalled 41,814 tons, of the value of £333,739, and the average value of the copper was 20 per cent. Nine shafts have been sunk, the deepest of which is 153 fathoms. The ore occurs in a regular defined lode, with occasional bunches. (1887.) The description given (1890) by Mr. J. S. Scott, secretary to the company, is as follows:—"This company holds a lease of Crown lands adjacent to the Moonta Mine. The property contains six lodes, which strike N. 12° E., and have an average underlie of 3ft. per fathom. They vary in width from 1ft. to 6ft., with here and there deposits which go from 10ft. to 15ft. in width. There are nine shafts, and their several depths are 165, 120, 100, 90, 80, 65, 60, 40, and 30 fathoms, following the dip of the lode. The total length of drives is 2,550 fathoms, and crosscuts have been driven to the total extent of 250 fathoms. The matrix of the ore is quartz, and occasionally portions of the bedrock, the walls of the lodes being composed of porphyry. The ore is a chalcopryite, from 20 per cent. to 30 per cent., and bornite 50 per cent., and the yield is from 1 to 4 tons per fathom." It is stated that £58,899 has been distributed in dividends among the shareholders. Six months return at end of 1898—deepest shaft, 175 fathoms; ore raised, 203½ tons, averaging 22½ per cent.

Official returns for the years 1903-6 show that during this period 17,756 tons of ore were raised, yielding 3,636 tons of concentrates worth from 14 per cent. to 17 per cent. copper.

THE HAMILTON MINE.—Situated in the Mount Fitton district, near the Hamilton Creek, and 2½ miles from Billy's Springs. For a distance of about 575yds. in length a large number of openings and several small shafts have been sunk; the latter range from 12ft. to 60ft. in depth, the deepest being sunk on the footwall portion of the lode, which contains veins and bunches of good ore, and extends the full width of the shaft, from the surface to its present depth. In another shaft, sunk to a depth of 15ft., a solid body of green carbonates and grey ore, 4ft. wide, is exposed, a bulk assay from which gave 21 per cent. of copper. In all the other workings the usual class of ore shows to greater or less extent, but in no instance has the width of the lode been tested. The Inspector of Mines expresses his opinion that this is one of the best prospected and most encouraging of mines, and that it should improve in value with development. (I.M.R., 1-8-99.)

In July, 1900, the inspector reports that during the last 11 months the work of prospecting, principally by surface openings, has been continued, and in each instance green carbonate and grey ore has been exposed. The pit then being worked is situated on top of the range, 350ft. above the level of the creek; the

depth was 10ft., showing lode matter 3ft. wide, containing veins and bunches of high-grade green carbonate, grey ore, and copper glance, giving very good average in bulk. The development is encouraging, and sinking should be continued. Samples taken from this place assayed as under:—

First sorted ore.....	2oz. 10dwts. silver....	61½ per cent. copper.
Second “	7oz. silver	48 “ “
Third “	—	30 “ “

(I.M.R., 5-7-00.)

No extensive operations in the way of development have yet been done here, but prospecting by shallow shafts and costeans continues, the deepest shaft being 55ft. Seventeen tons of 48 per cent. ore have been sent away up to date. (4-3-04.)

HAMILTON'S CLAIM.—A new find, about 1½ miles from Yudnamutana, on the road to the Daly Mine. The lode strikes S. 60° E., underlies S.W., and, so far as opened up, is about 4ft. 6in. thick. It consists of calcareous, ferruginous, and siliceous breccia. On the footwall side it is more highly ferruginous, and consists principally of spathic iron and iron oxides, and contains small bunches and nodules of grey and ferruginous copper ore, a little green carbonate, and copper sulphide. Very little work had been done at time of inspection. Worth sinking upon and prospecting at depth. A sample taken assayed—copper, 18.7 per cent.; silver, 1oz. 7dwts.; and gold a trace. (George, 25-4-04.)

HARRIS HILL COPPER MINE.—Situate 2 miles N. from Tumby. Has two defined lodes running E. and W., and 27ft. apart. From a small hole close to the main lode half a ton of green carbonate and red oxide ore was taken. In August, 1897, four shafts had been sunk to a depth of 15ft. Two of the lodes yield red oxide of copper, assaying 25½ per cent. There are also green and blue carbonates and sulphate of copper.

HARVEY'S RETURN.—Situating about 4 miles S. of Beltana. The locality is in flat country, and the lode formation being overlain by alluvial is difficult to trace, except in places where detached outcrops appear. Two shafts, 55ft. and 75ft. deep, have been sunk, disclosing lode matter which from 18in. at the surface gradually makes larger in depth. The material is of a siliceous nature, containing chiefly green carbonates associated with iron. About 14 tons of ore have been raised at various times, ranging from 4 per cent. to 16 per cent. A sorted sample of ore taken near the surface N. of the 55ft. shaft assayed 20½ per cent. The strike of the lode is N. and S., and the dip almost vertical. The enclosing rock is slate of a favorable character, and the vein is promising enough to be further prospected, at first by driving from the present shaft at the most favorable points. (I.M.R., 6-12-99.)

HEYWARD'S.—Mineral claim 1323, adjoining the Koon Mine, near Tumby Bay. A few trial pits have been sunk in various places, and one shaft sunk to a depth of about 30ft. The lode matter is 2ft. 6in. thick, showing blue and green carbonates of copper freely. Further sinking and development is recommended. (I.M.R., 7-9-99.)

HILLSIDE COPPER MINE.—This property was formerly a portion of the old Kapunda Copper Mine, which on discontinuing was divided into three separate portions. The Hillside portion comprises about 50 acres adjoining the Kapunda Mine on its S. boundary, and, from the strike, the lodes in the latter mine will evidently pass through the former. Towards the centre of the property there has been exposed by a trial pit a strong siliceous lode formation, 3ft. wide, striking N. and S. in a direct line for Dutton's Hill. The same formation crops to the surface about 500yds. further S., showing that it is continuous, and, although not containing any copper on the surface, should be prospected by one or more trial shafts to the water level, say, to the depth of 70ft. or 80ft., at which point, in that locality, the copper contents usually become more pronounced than near the surface. The principal workings have been confined to the S.E. portion of the property, a continuation of the lodes worked by the Kapunda. They consist of a large number

of small shafts, from 20ft. to 50ft. in depth, from which at various times, and mainly by tributaries, have been extracted large quantities of high-grade material, yielding at times over 40 per cent. copper. The ore was mainly green and blue carbonates, with smaller quantities of azurite occurring irregularly throughout the formation. The enclosing rock is of a soft aluminous character, apparently of great width, and extending for a considerable length. In the early days a shaft was sunk slightly S. of these workings to the depth of 155ft., and, so far as could be ascertained from reliable sources, disclosed lode matter from 12in. to 18in. wide, consisting of black oxide of copper, first products returning 45 per cent., second 26 per cent.; but owing to the suspension of the main workings in the Kapunda Mine and the water rising to within 70ft. of the surface, all work therein was discontinued. To develop this property it would be advisable to sink one or more trial shafts on the siliceous formation, which could be done at a low price per foot; also a main shaft, 11ft. by 4ft., timbered and divided into three compartments, should be sunk in the vicinity of the continuation of Hart's, Dunstan's, Magor's, and Tratton's lodes to the depth of from 300ft. to 400ft. This would unwater a considerable extent of unexplored ground, and, from general indications, would leave large quantities of ore available for working, that, with the present facilities of railway communication and other advantages, should be highly remunerative. Owing to the soft, friable nature of the rock the proposed work should not be of an expensive nature. I have no hesitation whatever in classing this property as a sound, legitimate mining venture that has every reasonable chance of success, and will fully justify any expenditure that may be required to open up the mine. (I.M.R., 19-4-05.)

HUNDRED OF HAWKER, SEC. NO. 75.—Situated 17 miles W. of Franklin Harbor. The bed rock outcrops in the higher portion of this section, showing in places lodes and veins of copper-bearing material, and on one of these a shaft has been sunk to a depth of 25ft., exposing a lode formation about 4ft. wide, composed chiefly of slate and veins of lode matter containing seams of blue and green carbonates of copper associated with iron. Fair samples can be picked, but in bulk the value is very low; this may improve in depth, and the shaft should be continued for another 25ft. as a test.

Sample from shaft bottom 2 per cent. copper.

“ quartz and ironstone $\frac{1}{4}$ “ “

“ quartz and pyrites trace of gold only.

(I.M.R., 31-7-01.)

HERCULES COPPER MINE.—Situate about 6 miles N. from Waukaringa. Inspector Parkes reported (29-8-90) three distinct segregated veins; general strike S.S.W., with dip E.S.E. 45°; country rock, indurated sandstone and slates. A shaft had been sunk 44ft. on W. vein; at the bottom the vein pinched and was of no value. Another sinking had opened upon a lode consisting of quartz and copper, and he advised that prospecting by deeper sinking should be carried out. Work has recently been restarted here. (1907.)

IRON KING COPPER PROSPECT.—Situate about 20 miles E. from Hawker, hundred of Adams. In January, 1837, the Government Geologist examined the claim and found that there was an outcrop of magnetite (magnetic iron oxide) some 60ft. wide and 12 chains long, striking in a N.E. direction through vertical beds of clay rock, calcareous slates, and limestone. The indications are not sufficient to warrant much outlay beyond surface prospecting.

Broken Hill Workings.—Here an outcrop of ironstone rises about 20ft. above the surface; it is about 100ft. in length and 40ft. thick. Vertical shaft sunk on N. side of the outcrop; water-level, 130ft. E. from this a second shaft has been sunk, 48ft. deep, with drive N. from bottom of 12ft. through copper-stained slate. No evidence of a lode. Samples from outcrop gave, on assay, no return of gold or silver, and 42 per cent. copper. (George, 5-7-01.)

IVY QUEEN (formerly known as "Niltibury").—Situated about 8 miles N.W. of Blinman. The then Inspector of Mines (Mr. D. D. Rosewarne), reporting June 1st, 1889, states that the mine has been worked for silver and lead, the latter assaying up to $71\frac{1}{2}$ per cent.; the silver is in very small proportion, in six samples not reaching 50zs. Much work has been done. No. 1 shaft is sunk 96ft., and there is a strong vughy lode carrying pockets of manganese and plumbago; it strikes N.W.W. underlying slightly E. No. 2 shaft is 87ft. deep, and shows a small branch of lead all the way; the lode is split, but, judging from the underlies of the branches, will unite in depth again; the two outcrops are 100ft. apart. A crosscut was put in from the bottom of No. 2 shaft to cut the W. branch; this was stopped at 50ft., when a few feet more should cut the branch. Costeaning on the W. outcrop has exposed a good show of lead ore; this should be an inducement to continue the crosscut and test this portion of the lode at the 87ft. level. To the W. a shaft has been sunk 49ft., exposing a fair show of argentiferous lead and carbonate of copper; the surface is covered with limestone. On the N. end of the claim a tunnel has been driven 100ft. into the hill. The main lode on this property shows lead in patches for 2 miles, and it is a true fissure lode; it is well worthy of a thorough trial in depth, and apparently No. 2 shaft is the best place for this. Some old workings show massive lead ore, and it can scarcely be possible to see such surface prospects in conjunction with a true lode unless payable deposits exist. (I.M.R., 1-6-89.)

Twelve years later the Inspector (Mr. W. H. Matthews) reports:—It is traversed for a considerable distance by a strong crystalline limestone outcrop showing copper stains and manganese. A shaft has been sunk to the depth of 50ft., disclosing a formation from 12ft. to 15ft. wide, carrying bunches of high-grade copper, chiefly grey ore, copper glance, and green carbonates, which was worked for about 70ft. in length. Owing to the amount of *debris* in the shaft bottom and drives, these could not be inspected; but it was stated that at the 50ft. level a fault or slide had come in, making the ore of less value, and this had determined the original company to discontinue work. The syndicate then working was engaged in cleaning up the workings and timbering the shaft, with the object of sinking deeper—the proper course to adopt. Sample from the dump, said to have been raised from the shaft bottom, assayed 43 per cent. copper per ton, and sorted sample from cleaning out of the old workings gave $6\frac{1}{2}$ per cent., and a considerable amount of iron, valuable for smelting purposes. The prospects are considered favorable. (I.M.R., 26-3-01.)

JAGO AND HARRIS'S PROSPECT.—Locality, hundred of Uroonda. There is an outcrop of limestone, quartz, and gossan, containing copper pyrites and carbonates, the formation being in one place 2ft. 6in. wide; strike N. 50° E. The prospectors have sunk shallow shafts and excavations, and an assay return of sample gave $3\frac{1}{2}$ per cent. of copper.

Copper ore has also been discovered and prospected to a small extent on section 20, Uroonda, and on mineral section 5777, Moockra,

JOHN BULL MINE.—Situated about 4 miles E. from the township of Beltana. The original finders, four miners, worked on these claims for 12 months, without the aid of machinery. The lode, as it appeared on the surface, was almost flat. About 50 tons of ore were tried, and gave nearly 45 per cent. without dressing. (1860-9). In 1899 two men were working on a very flat vein of copper from 2in. to $\frac{1}{2}$ in. thick, enclosed in hard indurated slate, and assaying up to 43 per cent. for fine copper. In the vicinity the ground was worked for alluvial deposits of copper slugs. A report dated 27-8-02 states that an inclined tunnel, a vertical shaft, and several pits and costeans have been made in brown and blue fissile highly fractured clayslates lying very flat, strike N.E. and S.W., underlie N.W. at about 10° . A portion of the bed is stained for a thickness varying from 1in. to 12in. with carbonate, while copper glance occurs in the stained part, the joints, and also along the bedding for thickness of from $\frac{1}{2}$ in. to 1in.

JUNCTION (Leigh Creek).—Prospected by a number of shafts and trial pits, the deepest being 33ft., or water-level. In almost every instance a decomposed slate material was exposed, containing small veins and nodules of green carbonate, but no defined lode was then visible. (I.M.R., 2-7-00.)

KANAPPA MINE.—Situate on section 1836, hundred of Angas, and 37 miles E.N.E. from Adelaide. The Government Geologist inspected this mine (July, 1898), which was worked five years after its discovery in 1867, producing, it was stated, 300 tons of copper ore. The mine was again taken up 15 years ago, and 80 or 90 tons of ore was raised in 12 months. The original shaft, 50ft. deep, and the drives were full of water. Recent workings include open cuts and shallow shafts on the lode. Samples from the spoil heaps and copper-ore tailings assayed from 4dwts. 12grs. to 5dwts. 23grs. gold, and from 3dwts. 30grs. to 8dwts. 13grs. silver. Samples from recent workings showed a trace of gold. The recommendation of the Government Geologist was that prospecting at depth should be carried on for copper and gold.

The Inspector of Mines states :—Very little recent work had been done. The principal workings that could be examined consist of a tunnel and open cuttings. The former has been driven about 150ft., intersecting the lode, which carries a vein of copper-bearing material about 18in. wide, of rather low value; from the back of the tunnel a portion of the lode has been stoped, but as the workings were not in a safe condition, it could not be examined. From the tunnel level a winze has been sunk. It was stated that the depth was 60ft., with good ore remaining in the bottom, but the condition of the workings and the winze being partly filled with mullock, prevented any inspection being made. The surface workings show the lode formation to be, in places, from 3ft. to 5ft. wide, containing a vein of copper-bearing matter on the footwall. In one portion of the open cut a shaft has been sunk about 40ft., the character of the material being, so far as could be seen, of a siliceous nature, carrying blue and green carbonates and yellow ore. A sample taken from a small selected parcel, supposed to have been raised from the bottom, returned 10 per cent. copper per ton. There are other shafts and workings on the property, but apparently as the ore is removed the workings are allowed to fall in, consequently no opinion as to their value can be formed. (I.M.R., 29-11-02.)

KANYAKA MINE.—Situated in the hundred of Kanyaka. In a country consisting chiefly of pipeclay, decomposed slate, and soft sandstone, there is a very well-defined lode, having near the surface the appearance of indurated clay, strongly stained with copper, and containing occasional stones of ore of fair average percentage. The lode is from 2ft. to 30in. in width, but is rather flat, dipping from the horizontal only about 2ft. in the fathom. A great deal of gypsum is found at the sides of the lode. Several shafts have been sunk, the deepest of which is 15 fathoms, and these are connected by drives extending for about 40 fathoms. (Austin, 1863.)

Situated about 4 miles N.N.E. from Gordon Railway Station. Work on this mine has recently been resumed, and about 200 tons of ore have been treated, for an average value of 10 per cent. There are a number of shafts and surface openings, in no instance of any great depth, extending for fully 200yds. along the formation, which strikes N.W. and S.E., the matrix being decomposed slate and sandstone, strongly copper-stained, with bunches and deposits of good-grade material in the form of blue and green carbonates, and a lesser proportion of azurite. At the S. end the formation is from 2ft. to 3ft. wide, underlying steeply. At the N., in addition to small shafts, there is an open cut 50ft. by 12ft., and 25ft. deep; formation here is 4ft. to 6ft. wide, composed of soft gritty sandstone, with green and blue carbonates freely disseminated through the material, which can be dressed up from 10 per cent. to 12 per cent. The sinking of a shaft opposite the open cut would give an opportunity of proving the ground below the water-line, and as the country rock is of a friable nature, and working comparatively inexpensive, this development is to be recommended. Two samples taken from the open cut returned 6½ per cent. and 17 per cent. of copper, respectively. (I.M.R., November, 1900.)

KANYAKA, SEC. 98.—Radford's Creek, about 8 miles from Gordon. For a considerable width the country rock is soft slate and sandstone, portions being very much kaolinised. In this, at various points, three small trial shafts have been sunk, and in one of these a copper-bearing formation, from 2ft. to 3ft. wide, has been exposed; it strikes N.E., and a sample taken gave $4\frac{1}{2}$ per cent. of copper. The country rock is soft and friable; the prospecting of the property would not be expensive, and the prospects are good enough to warrant the sinking of one or more shafts on the line of lode, and crosscuts driven through the kaolinised matter, which in several places, for a considerable width, shows encouraging traces of copper. By this, any veins and formations at present not visible, owing to the overlying material, would probably be intersected. (I.M.R., 26-10 00.)

KANMANTOO MINE.—Situated 33 miles S.E. of Adelaide, in the property of the South Australian Company. It was worked by them from 1846 to 1852, yielding 3,410 tons of fair ore. It was found, however, that the expenses were greater than the profits, and work ceased. Subsequently mining has been carried on by small local companies at different times, but never at a profit, and the mine was not worked for some years. Mr. J. B. Austin wrote in 1863 as follows:—

The principal lodes are the Kangaroo, Emily's, and the Boundary lode. The two first run N. and S., and the latter is a counter lode. The first lode yielded yellow ore of a moderate percentage. Emily's lode gave large quantities of yellow ore, which at the 10-fathom level gave place to red oxide and native copper. Two levels have been driven on the lode at 16 and 26 fathoms respectively. The copper produced at the smelting works from the ore now being raised amounts to about 12 tons per month. A great amount of work has been done at this mine since its commencement. The South Australian Company raised about 4,000 tons of ore, and opened a large extent of ground. Mr. W. B. Dawes, the subsequent lessee, raised about 1,900 tons. Smelting works were built in the neighborhood of Scott's Creek, and consisted of a calcining, a reverberatory, and a refining furnace, and other necessary buildings.

The Inspector of Mines, reporting in 1889, said the shafts had caved in by reason of non-working, but that the large open quarries bore evidence of the size of the bunches of carbonate ore worked. The series of lodes and crosscourses make lenticular bunches of ore in a lode bearing N. and S. About 15,000 tons of ore had been got by occasional working during a period covering 30 years. The water proceeding from one of the crosscuts holds sufficient copper in solution to yield precipitates of high grade, which would supply a regular income for opening up the mine, which is not yet explored beyond the 30-fathom level. The Inspector added that a mine that had from carbonate ores given such returns as shown in this case, and that had not been worked deeper than the 30-fathom level, should certainly have a reasonable amount of expenditure in opening up thoroughly, and erecting the necessary dressing machinery.

KANMANTOO MINE WEST.—Situated on a section adjoining the last-mentioned mine; but no great amount of work done upon it, nor any special results recorded. Some good carbonates were obtained in one part of the mine. (Austin, 1863.) The Inspector of Mines says (1889) this property has the Paringa lodes, and is worthy of further test. With sufficient capital to provide dressing machinery and open up the mine, payable returns might be expected. A 6in. lift would keep the mine dry and low-grade ore might be made to give returns, because of the possibility of economical working, and the proximity of the railway.

KAPUNDA MINE.—Situated N. of Adelaide some 50 miles. It is the oldest copper mine in South Australia, having been discovered in 1842 by Mr. Francis S. Dutton and Mr. Charles Samuel Bagot. The workings are on hilly ground of moderate elevation. The first ore was raised at the Kapunda Mine on January 8th, 1844; and on the 23rd of the same month, five dray loads were dispatched to Adelaide. The news of the discovery had the effect of stimulating the search for minerals in all directions. There are four lodes, of widths varying from 4ft. to 6in. The main lode is intersected by Cox's lode at an angle of 25° ; Hart's lode crossed both Main and Cox's, and it was there that the best deposits of ore were discovered. The direction of the lodes is N. 25° E., and the underlie as a rule is 2ft. in the fathom. Associated with the metallic minerals is a run of blue decomposed slate on the E.

and N., red soapstone on the W., and on the N.W. a hard dark rock which dips toward the S., and though seen on the surface is not again met with until a depth of 75 fathoms is reached. The proportion of metal to the ton is about $18\frac{1}{2}$ per cent. There are eight shafts, comprising two of 75 fathoms, one of 35 fathoms, and five ranging from 14 to 25 fathoms. The water-level is 8 fathoms below the surface. On the 14th June, 1879, the mine was sold under liquidation, and from that date to about May, 1886, was worked by tributers. The ore raised by them is valued at about £9,000. In Hareus's "South Australia," 1876, Mr. J. B. Austin stated that the quantity raised from the time of the opening of the mine until it was sold averaged 2,000 tons per year, or a total of about 70,000 tons. At the 75-fathom level an exceedingly rich lode of from 2ft. to 3ft. in width was found, consisting of yellow sulphide of copper, said to be equal to 24 per cent. Mr. Alfred R. C. Selwyn, Government Geologist of Victoria, who visited the Kapunda Mines in 1859, remarks :

The mines are worked in a very peculiar soft aluminous rock of various colors—from pure white passing into pink and red, grey, and blue. Frequently it is either covered with spots or traversed at right angles to the beds by thin veins or streaks of a pure white soft mineral, probably silicate of alumina. The galleries are all driven with pickaxe and spade, the rock seldom being hard enough to render the use of powder necessary. The general dip of the beds near Kapunda is W. 10° to 20° S. The veins, of which there are several running in parallel lines, N. by E., and S. by W., have also a W. underlie from 25° to 80° . To the N.E. they all terminated abruptly in a soft dark-blue pyritous slate, which runs N.E. and S.W., dipping to the N.W. from 25° to 70° . On their S. strike the veins are all intersected by a series of nearly E. and W. faults, throwing them to the E. in steps. The ores, blue and green carbonates and red and black oxides and native copper, seem to occur in very irregular veins and patches occasionally in the planes of the bedding.

The copper from this mine, it is stated, has always, because of its purity, commanded the highest price in the world given for that metal.

Under date March 3rd, 1899, the Government Geologist reports :—

Owing to the mine being flooded, examination was confined to an inspection of the open cuts and surface workings. Verbal information concerning the lower workings was obtained from the miners hereunder named, who were connected with the mine in a practical way at the time that it was in full working order, namely, Messrs. Mehennett and son, Truscott and son, Hooper, and Williams; and also the reports furnished to the proprietors severally by Captain F. B. Oldham (who was engaged on the mine many years prior to 1867), by H. T. Truscott, of Kapunda, and R. J. Hooper, also of Kapunda, both miners, were studied.

The evidence collected shows that there are several lodes, which strike more or less meridianally and dip in a W. direction, in some cases crossing one another. The outcrops of four of these lodes were pointed out to me, namely, Dunstan's lode, Hart's, Magor's, and main lode. These are all to the E. of Harris's shaft, and the three first named strike N. 10° to 15° E., whilst main lode strikes N. 16° W. They all dip to the W.

Harris's shaft is 80 fathoms (480ft.) deep. By a drive put in at 70 fathoms Dunstan's, Hart's, Tratton's, and Magor's lodes were cut in 25 fathoms of driving. Dunstan's lode was reached at a distance of 6 or 7 fathoms E. from the shaft, and was stoped upwards from the 70-fathoms to the 30-fathoms level for about 25 fathoms in length. Hart's lode was stoped from the 70-fathoms to the 40-fathoms level for a length of about 40 fathoms. This is described as the best lode in the mine. Tratton's lode, which is said to be a large one, was stoped up to 30 fathoms for 30 fathoms in length. Magor's lode was similarly stoped. Main lode bears evidence of having been worked along the surface by open cut for about 350ft.

At the time of my visit rich ore was being raised by a tributer from a shaft sunk on an unworked block of this lode below the open cut.

Buhl engine shaft is 132 fathoms W.N.W. from Harris's shaft, and is 75 fathoms deep. These two shafts are connected by a level at the depth of 70 fathoms. Main lode was cut in this level to the E. of Buhl shaft, and was stoped up to the surface for about 100 fathoms along the lode, which was well defined and had a width of 6ft. where cut. Further E. is another lode, named "Robert's," which was worked down to a depth of 30 fathoms, and for a length of about 20 fathoms.

The lodes above mentioned appear to be the chief lodes in the mine, and those which have been worked at the lowest level, 70 fathoms. But, besides these, two other lodes, namely, Richards's and Hodge's, were cut in a level which connected Buhl engine shaft and Gribbin's shaft at a depth of 60 fathoms.

Richards's lode is 10 fathoms N.W. from Buhl engine shaft. Its course is N. and S. with a dip W., and it was stoped out for a length of 15 or 20 fathoms. Hodge's lode is 7 fathoms N.W. of Richards's; it was very rich, and was stoped for a length of 15 to 18 fathoms.

Between Gribbin's and Charlotte shafts (which are connected by a level driven at 50 fathoms) two lodes, the Charlotte and another, have been cut, and worked above that level. W. of Charlotte shaft the Wheal Dutton lode has been worked down to 37 fathoms for 18 or 20 fathoms in length. At Stockyard shaft, which is 40 fathoms deep, there are three lodes striking N. 10° E. They are named the Western, Middle, and Eastern lodes. At Hillside, in the adjoining section and in a line with main lode, there are two parallel lodes, 4 to 5 fathoms apart, which have been worked for 25 fathoms in depth and about 20 fathoms in length. These are said to have been rich in copper.

Captain Oldham states that some 50 tons of fine copper were shipped monthly from this mine for England during a period of 10 or 12 years, and that thousands of tons of ore were sold to the Burra Burra Company during the same period. Also that the Wheal Dutton was one of the best lodes; and that the deepest shaft in his time was the Buhl shaft, which had been sunk to 70 fathoms.

H. T. Truscott states that the deepest shaft, Harris's, is down to 80 fathoms, and that there is a "splendid" lode at that depth still unworked. He further states that the workings in this shaft were abandoned because of an influx of water.

R. T. Hooper states (September 20th, 1898) that the deepest shaft was Harris's, which was down to 80 fathoms, and from which was worked the Hart and Dunstan's lodes, at a depth of 70 fathoms, these lodes being left "strong and productive" under foot; also that from the stockyard shaft, which was 30 fathoms deep, two lodes were worked which contained rich copper ore and were very "promising." He adds that tributaries have been at work in the property ever since the suspension of the mine in 1878, raising ore from different places down to a depth of 10 fathoms, which is the water level.

The primary cause of the abandonment of this mine is stated to have been the great influx of water in Harris's shaft at a depth of 80 fathoms, and the incapacity of the pumping power to cope with it.

The existence of several of the lodes which have been mentioned may be traced by the surface excavations and remains of lode outcrops. And as regards the value of the mine, the fact that large quantities of ore have been raised from workings of a limited depth—the deepest shaft being only 480ft.—places the question beyond doubt, besides corroborating the statements of the miners who formerly worked in the mine, to the effect that the lodes were numerous and rich in ore.

It is not at all probable that these lodes die out or become unproductive at such a comparatively shallow depth as that above mentioned, and I am therefore of opinion that this mine is a most valuable one, and would well repay for reworking thoroughly and systematically. As the lodes all dip W., a main shaft should be sunk in that direction, as far as practicable, to a depth of 100 fathoms, and at that depth a level should be driven eastward to cut and drain the lodes.

It is doubtful whether any of the old shafts are in sufficiently good repair to allow of their being reopened and sunk to a greater depth, although some of them might be found of use after the ground and workings had been drained by means of a deep shaft.

As to the results likely to be obtained at deeper levels, the probabilities are vastly in favor of there being as good or better returns secured from below the depth of 420ft. as have been got from that above level. The copper ores found comprise native copper, green and blue carbonates, red and black oxide, copper glance,

copper pyrites, and doubtless other rarer ores. The rock formation containing the principal lodes consists of kaolinised claystone of various colors from white to blue. Generally it is soft, but sometimes it is indurated. The average strike is N. 10° to 20° W., and the dip is W., at 25°.

Captain Osborne, who was manager from 1866 to 1879, stated that the progressive work of the mine as regards shaft-sinking ceased in 1866, except that Harris's shaft, already 40 fathoms deep, was sunk down to 80 fathoms. The work carried on during the period indicated was mostly that performed by tributers, who raised ore from the lodes above the 70-fathom level, paying the company a royalty. He further states that the shoots of ore in the lodes he is acquainted with in the neighborhood of Harris's shaft were short, and the thickness of the lodes was on the average about 1ft., but Dunstan's lode was 2ft. wide on the average. Hart's lode at 80 fathoms depth was broken up into boulders, but the ore was worth 50 per cent. for copper. The underlie was 2ft. per fathom W. The ground was very soft when wet, but stood well when drained. The influx of water, when in 1878 Dunstan's lode was struck at the 80-fathom level, proved too much for the pumps.

Captain Osborne superintended the working at this mine of Henderson's process for leaching copper from poor ores. Large quantities of rock containing about $\frac{1}{2}$ per cent. of copper were excavated and treated. After being washed, and by this means concentrated to about $2\frac{1}{2}$ per cent., the ore was submitted to the leaching process, the copper being afterwards precipitated from the solution.

In other official publications the total value of ore sold is estimated at £1,000,000 sterling.

From statistics obtained through Captain Osborne from the manager of the English and Australian Copper Company, at Port Adelaide; the following table, showing the copper ore and precipitates purchased from the Kapunda Copper Company, has been compiled as a complete record of the sales during the period from 1870 to 1878, inclusive:—

Year.	Ore Sold.			Assay.			Precipitates Sold.			Assay.			Total Value.		
				Average.	Highest.	Lowest.				Average.	Highest.	Lowest.			
	Tons (21cwt.s.)	c.	q.	%	%	%	Tons (21cwt.s.)	c.	q.	%	%	%	£	s.	d.
1870	765	10	2	26	32½	23⅛	374	17	1	59½	62½	57⅛	21,347	15	2
1871	1,317	18	2	21	23½	14	249	19	2	66½	80	63	21,684	8	6
1872	1,730	13	0	13½	20	8½	51	8	1	59½	73½	34½	19,186	15	3
1873	1,838	15	2	13½	22½	8½	155	15	0	66½	78½	17	21,971	16	10
1874	1,391	12	2	14	17½	9½	121	13	1	60½	79½	24	17,385	2	6
1875	1,250	13	0	14½	19½	9½	129	4	0	63½	81½	25½	16,681	5	4
1876	1,428	10	1	15½	20½	12½	120	6	0	69	82½	35½	17,350	10	11
1877	1,194	17	1	15½	16½	11½	190	12	2	65	81½	38½	16,026	4	5
1878	314	7	2	16	17½	14	91	0	2	76½	84½	31½	5,649	11	0
	11,235	20	0	16½	—	—	1,484	16	1	64½	—	—	£156,843	9	11

This table speaks for itself; it is in reality a reliable record of the copper raised from the mine during the nine years mentioned from above the 420ft. level, from lodes that had been worked previously for a period of more than 20 years. It is also evidence of the value of the property as a mining venture. (Government Geologist, 3-3-99.)

The Inspector of Mines, Mr. W. H. Matthews, also examined the property, and reported October 2nd, 1899:—Situated $\frac{1}{2}$ mile S. of Kapunda. A portion of the workings is on rising ground, about 60ft. above the level of the plain. The country consists chiefly of rich black soil, through which runs a strongly mineralised belt, striking N.W., and fully 600yds. in width; this is traversed by a large number of

lodes and veins, running in diagonal direction, and, where crossing the mineral-bearing strata, making large deposits of rich copper-bearing material. The principal lodes worked towards the N. end of the mine are Charlotte's, Dutton's, and Daw's; towards the centre of the property, Langon's, Thomas's, Richards's, Coyle's, Robert's, and the main lode; towards the S. end, Tratton's, Magor's, Hart's, and Dunstan's. These each vary in places from 1ft. to 6ft. in width. On the surface the workings extend for fully 1,200yds. in length, and comprise several main shafts, the deepest being Harris's, 480ft., and a series of open cuts, from 30ft. to 60ft. in depth, and of great length and width. These open cuts are detached, as apparently the large ore bodies occurred where each group of lodes and veins crossed the mineral-bearing country, which is composed of aluminous rock, principally white, pink, and red, of a soft and friable nature, easily worked, and, if kept clear of water, requiring very little timber. With the exception of a little tributing, all operations have been suspended for 20 years (2-10-99), and as the water was within 80ft. of the surface, it was impossible to examine the underground workings, or describe them, except from information, which there is every reason to believe is correct, gleaned from persons who had been employed in the mine during the time that active operations were in progress. From the lowest point in Harris's shaft, 480ft., a crosscut was driven E., intersecting three distinct lodes, each from 2ft. to 3ft. wide, containing ore of good value; but the influx of water being so strong the pumping appliances were not of sufficient power to keep the works from being flooded, and the price of copper at that time being low, all work was discontinued. At the same time, on the E. side of the workings, towards the N. end of the mine, a pyritic lode, from 8ft. to 10ft. wide, worth 14 per cent., was being worked. A large number of drives have also been cut, connecting the various shafts, and a considerable amount of stoping has been done, producing, in nine years, 11,235 tons, giving an average value of slightly over 16 per cent., also 1,484 tons of precipitates, yielding an average of over 64 per cent., which returned a total value of £156,883. Since that time there have been usually from six to eight men employed on tribute above the water-level and dressing ore from dumps. After making the most exhaustive inquiries, and a very careful examination of the property to the water-level, the inspector expresses the opinion that there are still large deposits of ore to be extracted below the 400ft. level, and advises the sinking of a main shaft W. of the present workings, to a depth of at least 600ft. or 700ft. This would unwater the old workings, and leave about 200ft. of unexplored ground, and, judging from the character of the country rock, the work should not be expensive, and if carried out would be the means of reopening one of the most valuable copper-producing mines in the State. (I.M.R., 2-10-99.)

KARKULTO MINE.—Situated between Kapunda and the Burra, about 35 miles from the first-named township. This mine is chiefly remarkable from the fact that, though the indications of copper were considered extremely good, very little copper was obtained. Large and regular lodes were found, the walls were well defined, but the ironstone and gossan in them did not, as was hoped, give place to copper. (Austin, 1863.) It was held by the South Australian Mining Association conjointly with the Burra Mine.

KITTICoola MINE.—Situated $1\frac{1}{2}$ miles from the township of Palmer and 43 miles N.E. by road from Adelaide. It was formerly known as the Tungkillo, Reedy Creek, New Reedy Creek, and Great Wheal Orford, having been worked under these names by various companies, originally for copper and subsequently both for copper and gold.

It is recorded that the first company to work the mine was formed in 1845. Operations commenced a year or two later, and continued until 1852, the mine being then known as the Tungkillo or Reedy Creek. The ores were rich, but buncchy, and the lode worked was over 30ft. wide; the former averaged 22 per cent. for copper. The workings comprised two shafts of 60 fathoms and 40 fathoms, with an adit level at 40 fathoms 198 fathoms in length; also three levels on the lode of 95 fathoms, 70 fathoms, and 30 fathoms in length.

After this the mine appears to have been deserted for many years. In 1890 it was taken up and worked by the Reedy Creek Gold Mining Syndicate. The deepest shaft was then 420ft., and the total length of drives amounted to 3,068ft. The object of the syndicate was to extract gold from the pyrites contained in the lode below the water level. No record of results is obtainable.

In 1891 or 1892 the New Reedy Creek Gold Mining Company was formed to work the mine.

The directors' and mine manager's half-yearly reports, dating from January, 1892, to January, 1897, record the following facts:—

Half-yearly Report, dated June, 1892.—Forty tons of ore from the *debris* at the surface were sent to the Wallaroo Smelting Works for treatment. No returns are given. Five tons from the same source, treated by the Band and Albion Company, at Ballarat, yielded 1oz. 18dwts. 22grs. free gold and 1oz. 3dwts. 14grs. gold from concentrates—total, 3ozs. 2dwts. 12grs.=12dwts. 10grs. per ton. The concentrates assayed 3 per cent. for copper, and 36lbs. of that metal were extracted from them.

Half-yearly Report, dated January, 1894.—A trial crushing of 100 tons from the gossan lode (180ft. level) yielded 36ozs. of gold. The thickness of the lode was 22ft. The total quantity of ore from this lode treated was 405 tons, and it yielded 119ozs. 8dwts. 18grs. of gold—an average of 5dwts. 21½grs. per ton. The existence of a large body of “mineral ore” (sulphide) at the 300ft. level is mentioned, also that it was worth 8dwts. or 10dwts. of gold per ton.

Half-yearly Report, dated June, 1894.—Work during the half-year had been confined to the 120ft. and 180ft. levels; 3,849 tons of ore had been treated during the half-year for a yield of 795ozs. 11dwts. 12grs. of gold—an average of 4dwts. 3½grs. per ton.

Half-yearly Report, dated January, 1895.—Five thousand five hundred and thirty-five tons of ore had been treated for a yield of 759ozs. 18dwts. 4grs.—an average of 2dwts. 18grs. per ton. Mint value of this gold, £3 10s. 9½d. per ounce. Mention is made of a trial crushing of 28 tons from a reef on the hill, a little S.E. of Masterman's shaft (the main shaft), which returned 3ozs. 10dwts. of gold. The quantity of ore still left in the “shoot” then being worked above the 240ft. level was estimated by the mine manager at 35,000 tons.

Half-yearly Report, dated June, 1895.—Five thousand seven hundred and sixty-nine tons of ore had been treated for a yield of 658ozs. 15dwts. 12grs. of gold—an average of 2dwts. 7grs. per ton. Mint value of gold, £3 6s. per ounce.

Half-yearly Report, January, 1896.—Four thousand and thirty-eight tons of ore had been treated for a yield of 474ozs. 16dwts. of gold—an average of 2dwts. 8grs. The mine manager reports an enormous body of ore at the 240ft. level, and that the thickness of the lode was from 18ft. to 20ft., also that the ore was refractory (unoxidised). Work at this level was consequently stopped.

Half-yearly Report, July, 1897 (Final Report).—This contains the directors' report, stating that the water had been pumped out of the mine, and the shaft examined at 420ft., when it was found that the shaft had been sunk away from the lode.

Mining operations appear to have ceased altogether about December 31st, 1897. The stoppage of the mine was most probably due to the exhaustion of the richer oxidised ore easily available in the upper levels, and to the inability of the management to payably extract the gold from the sulphide ores of the lower levels.

The country rock consists of granite—both micaceous and hornblendic—which is associated with metamorphic talcose and micaceous granitic rocks, more or less kaolinised in places. The lode or lodes worked in the mine have an average strike of

N. 40° E., and a dip N.W. of from 58° to 60°. They outcrop on the slope of a steep hill which rises to a height of some 250ft. above the level of Reedy Creek. Other lodes outcrop in the vicinity at points S. and S.W. of the main workings, at heights of 60ft. and 210ft. respectively above the creek. One of these is quartz containing specular iron, green carbonate stains, and traces of grey ore and native copper. It is of considerable thickness, and should be prospected further, both for gold and copper.

At the other point a tunnel has been driven 35ft. on a quartz lode containing iron oxides and ores of copper in small percentage; its thickness is from 3ft. to 4½ft., and it dips N.N.W. at 53°. This appears to be a continuation of a lode which has been worked on the W. side of Reedy Creek (about to be mentioned), and may also be a continuation of the lode worked in the main workings; it has a promising appearance.

On the W. side of the creek a tunnel, known as Baker's, has been driven for a distance alleged to be 400ft. on a lode which outcrops along a bearing of W. 15° S., and has also been prospected by shafts. These workings are very old. The lode here dips N. at an angle of 60°. Baker's shaft, situated 130ft. N. of this tunnel, is said to have cut the lode at 120ft. A considerable quantity of copper ore is said to have been obtained here, but there is no available record of it.

The Main Lode and Workings.—There are supposed to be two lodes, viz., Masterman's lode and Baker's, on the Big Blow, but in reality there is one lode only, the two branches coming together when driven and sunk on. Masterman's lode is the lower and most E., and on it levels and crosscuts have been put in to work both lodes. The main shaft is stated to be 420ft. deep; at the time of my visit it contained water up to the 360ft. level. It is sunk on the inclination of the lode, and has an average dip of 58° N.W.

The following levels were inspected:—180ft., 240ft., 300ft., 330ft., and 360ft. levels.

The 180ft. Level has a total length of 480ft. on Masterman's lode, and 330ft. on Baker's, with which it is connected by crosscuts in two places; at the N. and S. ends of the Baker's lode level the two lodes merge into one, proving that they are one and the same lode enclosing a large body or "horse" of country rock. Judging by the excavations made in stoping, it appears that Baker's lode was an unusually large one, it having been stoped out for 300ft. in length, and in width from 10ft. to 15ft. in the central portion of the shoot, to 30ft. and 50ft. in the N. and S. ends respectively, where it junctions with Masterman's lode. Stoping has also been done in places on Masterman's lode; in the N. end of the level it thins out to a few inches and dips 72° N.W.; at the S. end it is 18in. thick.

The 240ft. Level.—At this level the "horse" of country rock contained between the two lodes diminishes both in length and width. N. of the main shaft stoping has been done for 180ft., and S. for the same distance on both lodes, but chiefly on Baker's, which latter had a width of 15ft. or 20ft. for the whole distance, judging by the excavations. Beyond these stopes the drive has been carried N. for 250ft. and S. for 220ft., or more, without any ground having been stoped.

The 300ft. Level.—From the main shaft here the lode has been crosscut in both directions, and has a proved thickness of from 25ft. to 30ft. N.E. the level extends for 255ft., and is all in lode for 150ft.; stoping has been done for this distance. Beyond the stopes the lode seen in the level varies in thickness from 2ft. to 3ft., and has a good footwall dipping 60° N.W. S.W. the level extends 150ft., the thickness of lode varying from 6ft. upwards. Near the S. end the level is all in lode stuff, so that the thickness has not been yet determined. In the extreme end a winze and crosscut have exposed two ore bodies, one 4ft. in thickness, the other 10ft., so far as visible.

The veinstone consists chiefly of iron pyrites, quartz, iron oxides, including micaceous iron, copper pyrites, carbonate, native copper, black oxide of copper, etc.; iron pyrites and quartz predominate.

Between the 240ft. level and the 300ft. level the "horse" of country rock thins out, and the two lodes, or branches, known as Masterman's and Baker's lodes, unite into one lode.

Samples for assay were taken from cuttings made across the lode, so as to obtain fair average assays of its contents in gold and copper; they represent about 90ft. along the lode. Two special samples were taken at the same time. Owing to a large quantity of ore being stacked in this level, more samples could not be taken.

The highest return obtained of an average of the lode was—Gold, 18dwts. ; copper, 30 per cent. The lowest was—Gold, 1dw. ; copper, $\frac{1}{2}$ per cent. The average of the nine samples being, per ton—Gold, 6dwts. 16grs. ; copper, 5.47 per cent. Value of gold at £4 per ounce, £1 6s. 8d., value of copper at 15s. per unit, £4 2s. ; total, £5 8s. 8d.

Of the two special samples, one returned gold, 2dwts. per ton ; the other, a trace of gold and 19 $\frac{1}{2}$ per cent. of copper per ton. (N.B.—Special samples are those taken from one spot in the lode. The term is used in contradistinction to average samples, which represent the whole thickness of the lode, or as much of it as is exposed in a level or winze). Only traces of silver were found in these samples on assay.

The 330ft. Level.—From a crosscut put in N.W. from the shaft 25ft. the level extends N.E. 135ft. along a branch lode, due probably to the intrusion of a "horse" of country rock. This lode varies in thickness from 5ft. to 11ft. ; it dips N.W. at an angle of 60° ; in the extreme end it has a thickness of 5ft. S.W. the level extends 50ft. directly from the shaft ; it is all in lode, of which there is a visible thickness of 13ft. in the end where a winze has been sunk on it. This appears to be the main ore body or lode ; the dip here is 55° N.W.

From winzes sunk from this level, and from the shaft, intermediate drives have been put in at the 347ft. level N.E. of the shaft, and at the 360ft. level S.W. of the shaft. These have disclosed a continuation downwards of the lode as a strong and permanent-looking formation ; the dip varies from 53° to 60° N.W., and the strike conforms to that of the lode in the upper levels.

Eleven samples for assay were taken from cutting made across the lode at the 330ft. and lower levels.

These assays represent a length of 235ft. along the lode. The highest return obtained of an average of the lode was—Gold, 12dwts. per ton ; copper, 4 $\frac{1}{2}$ per cent. The lowest was—Gold, 2dwts. ; copper, $\frac{1}{4}$ per cent. The average of eleven samples being—Gold, 6dwts. per ton ; copper, 2 per cent.

Six special samples taken from the same places as the average samples returned—

Ozs.		dwts.			
Gold,	0	7	per ton ;	copper,	10 $\frac{1}{4}$ per cent.
"	0	10	"	"	5 $\frac{1}{2}$ "
"	1	2	"	"	nil
"	1	1	"	"	6 $\frac{3}{4}$ per cent.
"	0	12	"	"	2 $\frac{1}{4}$ "
"	0	10	"	"	8 "

In the whole of these samples silver was returned by assay in six cases only, and from traces to 7dwts. per ton. The average assays show very clearly the presence of a fair average quantity of gold, and a small percentage of copper in the lodes beneath the 300ft. level. The special assays show that ore rich in gold and containing a fair percentage of copper exists, and that such ore can be separated from or mined separately from the poorer portions of the lode if necessary. By concentration, however, of the whole of the lode material, rich concentrates should be produced, which can be treated at the mine or sold on their assay value. Although the number of samples taken were necessarily few, these assay returns are very satisfactory and representative of the lode at intervals along its course. I have no doubt but that a more exhaustive sampling of the ore, whereby every few feet, both along and across the lode, could be tested, would result in the assay returns disclosing the existence of ore richer both in gold and copper than those given above.

From the 300ft. level downwards the work done so far has resulted in proving the presence of an immense body of ore which is available for this purpose. An estimate cannot be made of the quantity of ore until the mine has been systematically opened up below the 300ft. level, and drives and crosscuts put in to explore the lode at, say, 400ft. Between 300ft. and 360ft. it has already been proved for a length of 235ft., with lode still in the faces. In many places where the drives have not touched the walls its width is uncertain; it, however, amounts to from 11ft. to 13ft.

With an ore body of this size containing gold and copper in the proportions shown by assays there is a large field for the employment of processes of concentration, or any other of the modern methods of gold and copper extraction that may be used in a profitable manner.

The opening out of a level at 400ft. seems to me the first work that should be undertaken in order that the size and extent and richness of the lode at that level, together with the dip and position of the "shoots" of gold and copper, should be ascertained. In my opinion it is probable that these ore bodies will be found to increase in richness and extent when sunk on and opened up, and that with proper management a remunerative and important mine will be established, chiefly because of the gold contained in the ore, and also in a lesser degree on account of the copper. (Government Geologist, 24-5-99.)

Report of the Inspector of Mines:—From the surface down to the 330ft. there must, from time to time, have been a very large quantity of ore raised, as the lode formation ranges in size from 4ft. to 23ft. in width at the 330ft. level, giving an average width of from 7ft. to 8ft., striking N.E. by S.E., and underlying W. at an angle of about 55°. Country rock consists of micaceous granite and hornblende rock—in places more or less kaolinised and decomposed. The oxidised ore continued down to the 300ft. level; below this it gave place to the sulphide in the form of yellow and black ore, and pyrites containing gold, but requires special treatment for extraction. Some of the upper levels have been worked for close on 500ft. in length, and were thought to contain two parallel lodes—Masterman's and Baker's; but the fact of the two joining together at each end and the barren rock disappearing towards the bottom points to the conclusion of it being one lode with intrusive rock between, ranging from 2ft. to 17ft. in width. In the upper levels there is still a fair quantity of ore available, but my attention was chiefly confined to the 330ft., or present water-level, where, from various parts of the workings close to and at the water-level, I obtained six bulk samples, which gave the following returns:—

	Gold.		Copper.
North stopes lode, 5ft. wide	8dwts. ..	7½	per cent.
“ bottom drive lode, 4ft. wide	11 “ ..	1	“
“ “ “ “ 8ft. “	16 “ ..	12½	“
South drive lode, 5ft.	— ..	2½	“
“ stopes “ 9ft.	13dwts. ..	1½	“
“ “ “ 9ft.	15 “ ..	7½	“

which for gold and copper contents is a very fair average. Two samples were also taken from the slimes and tailings of the crushed ore, the former yielding 18dwts. of gold and 2½ per cent. of copper, and the latter returning 10dwts. of gold and 1½ per cent. of copper, showing that a close extraction under the present mode of treatment is very difficult to obtain. For the last five weeks' run ending February 8th there were treated 400 tons of crude ore, which yielded slightly over 89 tons of concentrates, returning a gross value of £745 3s. 4d., and during the six months ending the same date the total quantity of ore treated was 2,000 tons, giving an average value of £2 12s. 3d. per ton. The lode is strong and well defined, with good walls, and every appearance of the shoots of ore being permanent, and of the gold contents improving at lower depths.

To further test and develop the property it would at first be advisable to, in places, repair the present main shaft, unwater the last 100ft. sunk, then decide as to further sinking of the present shaft, or sinking a new one, to open up the mine from the W.

side of the creek, which eventually will probably be the better course to adopt. From the richness of the ore-body and general appearance I consider the outlook of the mine is very favorable, and will fully warrant the necessary expenditure in opening up the works at deeper levels with every reasonable chance of success.

The following machinery is on the mine:—Winding engine, 10-stamp mill, crushing tool and rock-breaker, Wilfley table, Warren's vanner, May's double jig, reverberatory furnace, revolving calciner, with 45-horsepower horizontal engine, and the usual appliances for conducting mining operations. (I.M.R., 7-5-00.) Owing to difficulties in connection with the smelting operations at the mine, work was discontinued.

KIBBLE HILL.—Situated about 5 miles E. of the Appealinna Mine. No definite lode has been found, but the country rock for a considerable length and width is copper-stained with green carbonates and small spots of grey ore. Two pits, from 6ft. to 8ft. deep, have been made in very hard ground, and nothing encouraging disclosed. Cross-trenching on the surface is recommended prior to any sinking. (I.M.R., 11-11-99.)

KINTORE MINE.—Situated 7 miles S.E. of Yunta Railway Station. A vertical shaft was sunk, and a vein cut at 40ft., which was followed on the underlie at an angle of 20°, and shows specular iron oxide and carbonate of copper, intermixed with quartz; but the Inspector of Mines was of opinion that this discovery was not worth following up (1889). In October, 1890, the Inspector reported that an underlie shaft had been put down 75ft. At 65ft. the vein changes in dip from 20°; nothing of value in sight, either there or in a vertical shaft sunk to cut the vein.

KIRWAN MINE.—Situated 4 miles S. from Mount Craig, 72 miles N.E. of Port Augusta, and about 12 miles from Hawker, at the foot of a range of hills sloping towards a plain to the W. The country consists of a light soft killas and a kind of pipeclay. There are several lodes and bunches of ore on the property, running generally to the E. of N., and underlying from 18in. to 2ft. in the fathom. Three shafts have been sunk, and at the bottom of the deepest, 21 fathoms, there is a lode between 3ft. and 4ft. wide, composed of quartz and copper pyrites. In a cross-cut driven to the S.E. a lode of fine blue and green carbonates about a foot wide was cut. A short distance to the W. two shafts were sunk on the course of the lode, which is composed of carbonates of copper intermixed with ironstone, and is traceable for 300yds. On another section, about 1½ miles S.E. of the Kirwan, a small shaft was sunk on a lode running E. and W., and which produced some fine grey and red oxide. The country on the Kirwan Mine differs somewhat from that on either side, and would seem to be a band of more favorable strata for copper. (Austin, 1863.) Recently the property was examined by the Mines Inspector, who states that the claim has been worked for copper twice, and was started over 20 years ago. The ground is favorable, and there are several outcrops. There is a large N. and S. lode composed of iron, quartz, and manganese, and a strong pyritous lode running N.E. and S.W. A tunnel driven into the hill disclosed six veins of copper of excellent grade. It is a fair prospect, and worthy of being tested in depth. Several tons of ore, yielding 30 per cent. of copper, are stated to have been raised at this mine. (1889.)

No work had been done since 1889, and the underground workings could not be examined. The country rock is soft slaty material of a favorable character. No defined lode or deposit can be seen on the surface, where the main shaft is sunk; this is reported to be 126ft. deep. From the material on the surface, which apparently came from the bottom, the vein must be of fair size, containing a considerable quantity of pyrites; sample from this gave only a trace of copper. Opposite the shaft a tunnel has been driven in the hill for 40ft., exposing veins and bunches of lode matter, but at the present level they are not defined, and are of little value. About 200yds. W. of the main shaft there is a strong lode formation, striking N. and S., composed of quartz and iron, with a little manganese. Two trial pits, each 6ft. deep, have been sunk on this, but no traces of copper could

be seen. On the surface there was a small parcel of dressed ore. A sample assayed $23\frac{1}{4}$ per cent. If this came from the main shaft, it would be advisable to ascertain the size of the vein, and this could be done at a small cost, as the shaft was apparently in very fair order. (I.M.R., 17-11-99.)

KOOAGNIE.—Carbonates of copper were found on private land 4 miles from Kadina, and costeaning led to the discovery of a lode formation. A shaft was sunk on the dip of the lode S., but the vein not proving productive of any large bodies of ore, a vertical shaft was put down 80ft., and cross-cutting was carried on. The indications on the surface, in the estimation of the Mining Inspector, warranted a continuation of prospecting operations. (1889.)

KOONA.—Adjoining the Flinders Mine, near Tumby Bay. In the centre block three shafts have been sunk, ranging from 15ft. to 85ft. in depth on a line of lode parallel to that being worked in the Flinders Mine. In the deepest shaft, at 60ft., the lode formation was struck, being 4ft. wide, containing small veins and bunches of yellow ore, which gave assays up to 32 per cent. The enclosing rock is of the most favorable copper-bearing character, and the walls of the lodes are good and well defined, giving every indication that an improvement in value may be fairly anticipated in depth. In the W. block a considerable amount of work has been done by small openings and shafts, on a line of lode parallel to the centre one, the deepest working, so far as could be ascertained, being about 50ft. from the surface. The lode formation is from 4ft. to 5ft. wide, composed of ferruginous quartz matter, containing blue and green carbonates, of which, it was stated, a large quantity had been dispatched to the smelters. Sorted assays taken from the various ore dumps on the surface gave returns of $20\frac{1}{4}$ per cent. and $20\frac{1}{4}$ per cent. of copper. So far as could be seen, the lode has a well-defined and permanent appearance, and the general features are sufficient to justify an expenditure necessary to again open up the mine—not only to develop its resources at the water-level, but, with the assistance of machinery, to prove its value at a greater depth. There are other lode formations running through the property, each containing more or less copper, which could be tested for a small outlay. (I.M.R., 15-9-99.)

KURILLA—See WALLAROO and MOONTA, page 141.

LADY BUXTON.—Situated about 6 miles S. from Paralana Head Station. A shaft was down, in 1896, to the depth of 20ft.; and returns obtained in July of that year showed the ore yielded from 24 to $32\frac{1}{4}$ per cent. of fine copper. The lode on this property strikes N.E. 18° , with W. underlie, and consists of magnetic and other iron oxides and gossan, with seams and bunches of ferruginous copper ore, grey ore, and carbonates. Where it has been opened on it shows 14ft. thick. A tunnel has been driven 150ft., and several shallow shafts have been sunk, with short drives, along the course of the lode. So far mining operations have been confined to quarrying out the copper ore wherever it was visible, and no attempt has been made to prove its existence at depth by sinking an underlie shaft. (George, 17-7-01.)

LADY TENNYSON.—About $1\frac{1}{2}$ miles N. from Paull's Consolidated. Several parallel veins of calcspar and ferri-calcite strike S. 70° E., and underlie at a flat angle to the N.W.; they vary in thickness from lin. to 6in., contain bunches of copper ore, principally sulphide, and are worked by pits and costeans. About 4 tons of ore had been sent away. (27-8-02.) The claim is being worked in a small way, and fair returns of ore up to 25 per cent. and 30 per cent. are obtained. (1907.)

LAKE TORRENS MINE.—Situated adjacent to the Beltana Mine, on the Western Plains. It was originally taken out by resident squatters, and held by them for several years. The lode is said to show on the surface for a distance of 600yds., and is alleged to be 6ft. wide in some places, carrying good copper ore. (1860-69.)

LINDO'S CLAIM.—Situated at Cudlamudla, and not worth working, according to the judgment of the Inspector of Mines. There is, in very hard ground, a small irregular vein of ferri-calcite carrying carbonate of copper. (1890.)

LINDSCHAU'S SHOW.—Locality, about 1 mile W. from the Paralana Mine, Mount Fitton. The Government Geologist reports the existence here of outcrops of quartz stained with green carbonate of copper, and carrying a small percentage of that metal. A tunnel was driven from the bank of the creek, with unsatisfactory results, and the ground was abandoned.

LIPSON'S COVE MINE.—Situation, on the E. coast of Spencer's Gulf. In 1860 operations commenced on a lode producing grey ore, carbonate, and black sulphuret of copper. It was stated that there were a number of promising lodes within the boundary of the property, and shallow shafts were sunk, from which ore of a good percentage was obtained. Other places in the neighborhood were prospected, and strong lodes were discovered, some of which it was alleged could be traced for a distance of 3 miles.

LLOYD'S PROSPECT.—Situated on Ashby's farm, near Clare. The Government Geologist examined this venture in 1888, and pronounced that there was no lode, and nothing to lead anyone to suspect the existence of one.

LYNDA (known previously as "Mount Lyell," "Turnerton," "Mottram's," and "Lorna Doone").—Situate $3\frac{1}{2}$ miles N. from Leslie's Well. The Inspector of Mines reported (1895) very little development or permanent work. An open cutting, 20ft. wide and 14ft. deep, had been made along the strike of a large mullocky lode containing irregular deposits of rich copper ore; strike, W. 45° N.; dip, 45° . Several shafts sunk in the bottom of the cutting, the deepest 35ft. The ore gave an average of $25\frac{1}{2}$ per cent. copper.

The Inspector of Mines (Mr. W. H. Matthews) reports:—Situated about 25 miles S.E. of Farina and 22 miles from Lyndhurst Railway Siding. Towards the N. end of the property there has been a considerable amount of work done, the lode formation, shown by shallow workings to be fully 60ft. wide, exposing a very large quantity of lode material, containing green carbonate and red oxide of copper, which, with proper machinery, can be dressed up to a good standard. At the extreme N. end of the workings a prospecting shaft had been sunk 18ft., and a crosscut driven in the lode 15ft., showing the same class of material, some being of very high grade. S. of this a main shaft is being sunk to intersect the lode formation at a deeper level and to supply the mine with water. A continuation of the lode appears in the S. block, containing throughout, where exposed, chiefly green carbonates; from this point a number of trenches and small shafts expose for fully 70yds. in width numerous veins of lode material, containing carbonates and grey ore, which was being sorted for transit to the smelters. It was stated that up to the date of the inspection over 100 tons of high-grade ore had been sent away by the original claimholders, working from the surface to a depth of 15ft., and that it was intended to sink shafts to test the permanency and value of the material at the deeper levels. This the inspector considered the proper course to adopt, and was of opinion that further large quantities of good payable ore would be developed. (I.M.R., 27-7-99.)

A further report, dated September 19th, 1906, states more or less work has been carried on in this mine for many years, but it was not till January, 1902, that active operations were commenced by the present company (Lynda), and have since been carried on almost without intermission. The number of men employed until recently averaged about 18, and a considerable amount of copper has been extracted from shallow levels and near the surface. The workings extend for a considerable length and width, consisting of a large number of small shafts, trial pits, and open cuttings, being, with one or two exceptions, from 6ft. to 30ft. in depth. Some of the open cuttings disclose vein matter over 20ft. wide, composed principally of slate material containing veins of the various classes of ore, in places strongly associated with iron, and where this occurs it is usually found most difficult to obtain a very close extraction by concentration, the ore being apparently more suitable for smelting, but at present the grade is not of sufficient value to pay all the expenses, viz., raising, railway, and smelting charges to Adelaide or Wallaroo. The vein matter has a general strike of about N.W. and S.E., with an E. underlie of about

40°. Slightly E. of the main open cutting an inclined shaft has been sunk on the formation to the depth of 140ft. At about 50ft. or 60ft. from the surface the lode was passed through, showing a little carbonate of copper of little value beyond denoting the presence of the metal. At the depth of 116ft. a crosscut has been driven E. 115ft., intersecting the lode formation. From this point a winze has been sunk 18ft., proving the lode to be from 12ft. to 15ft. wide and showing every indication of continuing down. The character of the material consists of a compact body of quartz and porous ironstone, the latter being doubtless the result of oxidation, in which the copper contents have been leached out, leaving the insoluble matter in the porous condition referred to. Samples have produced copper traces and about 2½dwts. of gold per ton. A fairly complete crushing and concentrating plant was erected in January, 1902, consisting of stone-breaker, crushing rolls, Hancock's elevator and trommel, together with suitable engine and Cornish boiler, the latter being 32ft. long by 6ft. 6in. diameter. The whole plant is very effective, and since its erection up to the end of June has treated 7,786 tons of crude ore, producing 950 tons of concentrates, averaging over 20 per cent. copper. When first discovered, the surface prospects of this mine were exceedingly encouraging; but as the workings continued down the copper contents have considerably decreased. Still, considering the large tonnage of fair-grade ore that has been extracted, it is very desirable that the lode should be thoroughly tested below the water-level for the purpose of proving the existence of a sulphide ore-body or otherwise. To accomplish this the winze from the crosscut in the deep shaft should be continued on the incline of the lode; then, if proved payable, an underlie shaft could be started from the surface and connected with the winze at the 116ft. level. This would be preferable to any other course, as, owing to its low dip, a vertical shaft is undersirable, and this mode of prospecting would be the least expensive and equally as effective. (I.M.R., 19-9-06.) Returns up to December 31st, 1906, show a profit, and a dividend was declared in January, 1907.

MACDONALD HILL.—Situated on the Outalpa Run. The Inspector of Mines reported (1889) that very little work had been done, the deepest pit being 20ft. In the first pit there was visible a branch of very fair grade carbonate and oxide of copper, well worth sinking on; apparently a true lode, gradually increasing in size as depth is attained, with E. and W. bearing and S. underlie. Like most of the copper ores in the N.E., a small quantity of gold is present, but not sufficient to pay for cost of extraction. The other costeanings on the ground show that a considerable extent of it is copper-bearing, and the claims are only 2 miles from a railway. There is sufficient inducement for further prospecting.

MALONE'S MINE.—Situated about 8 miles from Watt's Sugar Loaf, and 11 miles from the township of Kanyaka. A lode containing stains of copper was found on the surface, and, on sinking, some good ore was met with. (Austin, 1863.)

MALLEE HUT.—Locality, about 16 miles S. from the Blinman Mine, and about 6 miles S.W. from Mount Emily. A lode opened in a creek showed good walls, with killas and fluccan and fine gossan in the lode, and a fair amount of green carbonate of copper and yellow ore. The lode is nearly perpendicular, and 18in. wide. A small shaft was sunk, but the mine was ultimately abandoned. (Austin, 1863.)

MAMMOTH BLACK RIDGE (SILVERINA).—This is situated 4 miles S. from Artepna Trig. and 3 miles E. from Artepna Dam. The Mine Inspector reported (1892) the existence of a large ironstone lode, with an outcrop in some places 40ft. high and 60ft. wide. It could be traced $\frac{3}{4}$ of a mile; strike N. 30° E., dipping W., and enclosed in calcareous clayslates. The lode consists of siliceous ironstone, with small spats of green carbonate of copper. A shaft was sunk on the W. side to the depth of about 90ft., and a crosscut made E. Favorable reports on the place were obtained from Mr. R. A. F. Murray, formerly Government Geologist of Victoria, and Mr. G. Thoreau, formerly Government Geologist of Tasmania.

MANDARIN.—Locality, 10 miles S.E. from Mount Lyndhurst Station, on the track from Lyndhurst to Mount Rose Mine, 2 miles N.W. of the crossing over Frome Creek. The Government Geologist examined this property in 1896, and reported that several shallow pits had been sunk, proving the presence of copper ore in places for a width of 100yds., and along the strike for about $\frac{1}{2}$ a mile. The ore consists of copper glance, red oxide, and carbonate of copper in veins in claystone and quartz; strike, N. and S. Slugs of rich copper ore, chiefly carbonate, were visible along the outcrop, which had been merely costeamed in different places. An exhaustive and systematic search would probably lead to the discovery of larger deposits of copper ore. Intermittent prospecting has been done here up to date.

MARY MINE (CORNELIUS CLAIMS, BENOWRIE).—Locality, 20 miles N.E. from Olary. The Inspector of Mines (1889) reports that on a ridge traces of copper can be seen for a considerable distance, and in the bedding of the strata there are bunches of copper. Parcels of ore yielding 18 per cent. of metallic copper have been sent away, but the general average of the ore is of lower grade, it being intermixed with iron oxide and silica. The enclosing rocks are granite and clay-slate, whilst beds of black micaceous gneiss are prevalent. Colors of gold were observable in the copper ore, and it was thought that the quantity of gold might increase if the copper deposits became more siliceous in depth.

A report dated November 7th, 1901, from the Inspector of Mines (Mr. W. H. Matthews) states that from time to time the mine has been worked for the last 20 years, and a large quantity of copper extracted. Returns from 1895 to 1898 show that 241 tons of ore, averaging 12 per cent., had been dispatched to the smelters, and from the latter year to 1901 300 tons were raised, averaging a little over 9 per cent. The principal work consists of an open cut about 80yds. long 50ft. wide, and ranging from 5ft. to 30ft. deep, which has disclosed a granitic-bedded formation, containing chiefly blue and green carbonates. Sorted samples taken from various portions of the workings returned $9\frac{1}{4}$ per cent. copper, $12\frac{1}{2}$ per cent., $7\frac{3}{4}$ per cent., and from 2dwts. to 3dwts. gold per ton. The richest class of ore occurs principally in veins and bunches, striking about E. and W., with usually a S. underlie. About 100yds. W. there are a number of small openings and shafts exposing the same class of material, which, probably, if worked and sorted, would be of similar value. For the future working of the ore exposed at present it would be advisable to sink a shaft at a favorable site 60ft. further E.; also sink one or more shafts from the bottom of the open cuts, about the centre and towards the W. end, to determine if there are other ore bodies below the present level, of which there is every indication, fully justifying further explorations. (I.M.R., 7-11-01.)

Later returns maintain the average of the ore forwarded from this mine, and it is now worked by a company and named the Benowie Copper Mine. (1907.)

MAROWIE.—Situated about 14 miles N.W. of Franklin Harbor, in the hundred of Miltalie. The main lode formation is 2ft. wide; it strikes N.E., with an E. underlie. The workings consist of a number of surface openings, the deepest being 8ft. The lode matter shows a higher grade at that depth than at the surface, and the copper ore occurs in the form of blue and green carbonates. Sinking should be continued, and further improvement may be expected. At 30ft. further W. a parallel vein, 12in. wide, and composed of green carbonates, has been exposed; this underlies to the W., and should be prospected by sinking. Seven tons of ore, ranging from 7 per cent. to 13 per cent., had been sent away, and 4 tons, of an average value, were then being dispatched. Sample from the main lode assayed $21\frac{1}{2}$ per cent. (I.M.R., 14-9-99.)

MATHESON'S.—Situated 3 miles E. of Leigh Creek. A shaft has been sunk to a depth of 100ft., the first 40ft. being vertical, and the latter portion along the lode underlie 45° E. The formation is clay-slate, very easily worked, and containing scattered veins and bunches of green carbonate throughout. The carbonate is of a very fair grade. Five tons recently raised gave 22 per cent. of copper. The inspector considered the property a fair prospecting show, and states that it should

be developed by a shaft sunk some distance further E. to intersect the lode at, say, 200ft., and prospect for other veins which probably exist E. of the present workings. (I.M.R., 16-11-99.)

Reporting in July, 1900, the Inspector of Mines states that a vertical shaft had been sunk recently to a depth of 90ft., or water-level, and at the 80ft. level a crosscut made 65ft. through soft kaolinised matter, containing here and there small seams and nodules of blue and green carbonates, but so far there is no indication of a defined lode; these seams and nodules, with the fine decomposed matrix, are broken out and washed, and by this means 37 tons of ore, returning from 6 per cent. to 22 per cent., had been sent away during the last six months, and 3 tons were awaiting transit. Samples taken assayed as under:—

From clean copper nodules	17½ per cent.
Bulk sample from dump, for future treatment	2½ “
“ “ “ “ “	1½ “

(I.M.R., July, 1900.)

Returns show that small quantities of ore continue to be forwarded from the mine. (1907.)

MAY FLOWER.—Situated about 32 miles N.W. of Farina. A formation of slate and sandstone occurs here, portion of which carries veins and seams of green carbonate. An open cut, from 19ft. to 22ft. wide and 16ft. deep, has been made on two veins, and has been continued by an inclined drive 20ft. long from the bottom. It is stated that over 47 tons of high-grade copper ore has been taken from this place. (George, 5-7-01.)

A later inspection showed that a little further prospecting and stoping work had been done, and nothing of importance disclosed. (27-8-02.)

MATTAPARA.—*Vide* POONA, page 120.

MATTAWARANGALA MINE.—This was situated 4 miles S.E. of Mattawarangala Head Station. It ceased working in the “seventies,” after a considerable amount of work had been done.

MCCONVILLE’S MINE.—Situated about 6 miles S. from Kanyaka, amongst low bald hills. There is a lode on the surface, running about 300yds. N. and S., and about 18in. thick. The ore, which is mixed with gossan and felspar, is not continuous, but occurs in patches. It is a rich sulphuret of a dark greenish-grey color. A shaft was sunk on the lode to the depth of about 3½ fathoms and a drive was then carried for 5 fathoms, copper ore being found throughout. (Austin, 1863.)

MEDINA COPPER MINE.—Situated about 8 miles N. of Oodla Wirra Railway Station. This was worked for copper in the early days, and it appears that a fair quantity of high-grade ore was extracted, down to about 40ft., where the copper gave place to slate material, containing small seams and veins of spar, with a considerable amount of pyrites. A shaft has been sunk to the depth of 100ft., with 50ft. of driving at the 75ft. level, disclosing a formation of calcareous slate, strongly iron-stained, and charged with pyrites; but samples taken show no metal of value. On the surface the formation has been exposed at various points for over 200yds. in length; but, excepting at the main workings, shows no copper ore. Apparently the ore occurs in irregular bunches or pockets, of good grade while they last. The formation itself seems about 3ft. wide, is enclosed in well-defined walls, and is probably permanent in depth; but the work done shows that any testing at depth would be of a purely speculative nature. (I.M.R., 2-1-01.)

MELROSE (Doris and Youngman).—Workings on Mr. Slee’s land, ½ mile S.W. of Melrose township. Near an old shallow shaft, which was put down about 50 years ago, an irregular formation, consisting of argillaceous matter, sandstone, and quartz, and carrying veins and seams of blue and green carbonate, copper pyrites and calcite is exposed in an excavation about 15ft. deep in its deepest part, and the formation shows in the bottom about 4ft. wide. It appears to strike N. and S.,

and have a slight dip to the E. An average sample taken from across the bottom assayed 2.4 per cent. copper, and the indications are sufficiently encouraging to warrant deeper sinking on the ore-bearing matter. (D.R. (Gee), 11-6-07.)

MID-MOONTA MINE (NEW MID-MOONTA)—Later worked as the "Moonta Central."—Situating near Moonta Mine. Exploratory costeaning was undertaken because of the direction of the Moonta lodes; and, favorable indications of deposits of ore being discovered, two shafts were sunk, the one called Harvey's and the other Morris's, 17 and 30 fathoms respectively. In the latter, levels were driven on the course of the lode at 24 fathoms, and a quantity of high percentage ore was taken out, the lode at foot averaging 4ft. wide, with every sign of improvement. As a result of the low price of copper, strong influx of water, and insufficient appliances and capital, the affair came to a standstill. An attempt was made to revive it a couple of years ago (1888), but resulted in liquidation before practical work was resumed. More recently an effort has been made to secure English capital, with a view to a resumption of work, and it is understood that the necessary capital has been secured. (1890.)

The Inspector of Mines, reporting in April, 1900, states that until recently little or no mining has been done for the last 24 years; previous to that time several shafts had been sunk, and a considerable amount of driving and stoping accomplished, the result being, it was stated, the raising of 400 tons of ore, yielding an average value of 20 per cent. When the present company first commenced work, about 12 months ago, operations were confined to the southern portion of the mine, where a shaft was sunk to the depth of 150ft.; work there being then suspended it could not be examined, but it was stated by those who had worked in the shaft that the lode was from 4ft. to 5ft. wide, containing black ore, with bunches of yellow ore appearing in the bottom. The *debris* on the surface shows both classes of ore, with iron and pyrites. From the general character of the material, and the information the inspector was able to obtain, he was of the opinion that the further sinking of this shaft would be the proper course to adopt in this portion of the property. During the last five months all work has been confined to the main shaft, which has been sunk to the depth of 210ft. on the lode underlie, which inclines W. 2 in 6, striking slightly E. of N., and is considered to be the continuation of the Prince Alfred lode worked in the Moonta Mine. To the present level it ranges from 3ft. to 5ft. wide, composed of siliceous material, containing in the lower levels chiefly yellow ore, the higher grade apparently making in shoots and branches. At the 132ft. level there has been a considerable amount of driving N. and S., and also from a large portion of the lode stoped from this point towards the surface the returns mentioned were obtained. Below this level, with the exception of a winze and the bottom drives, the lode is still unworked, and probably will remain so until the draining and the development works are further forward. The N. bottom drive has been driven 72ft., lode in the face being 5ft. wide, containing copper to a greater or less extent all through; but the chief copper-bearing vein is 18in. wide on the footwall side, and contains principally yellow ore, with a little purple ore of a very fair percentage. This drive, when connected with the winze, will unwater the upper levels, and prepare a large block of ground for stoping. S. bottom drive has been extended 30ft. For the first 12ft. the lode is of similar character to the N. drive; at this point a fault was met with, which forced the lode from 12ft. to 14ft. further E.; a crosscut in this direction has been driven, and the W. side of the lode intersected, exposing lode matter of low value. The best portion of the ore vein is apparently still further E., and the crosscut is being continued. At the 132ft. level, and slightly S. of the shaft, a crosscut has been driven 12ft. E. of the main drive, and a parallel lode exposed 4ft. wide; the ore-bearing vein being from 12in. to 18in. thick, portions being of very fair grade. The No. 2 shaft is sunk to the depth of 192ft., and is 150ft. N. of the main shaft; it is intended to continue the N. bottom drive from the main shaft until it is connected with this, which will leave ground available for stoping 150ft.

long by 78ft. in depth. On the surface there is at present about 250 tons of undressed ore and the inspector was informed there are several hundred tons of similar class ore broken in the stopes that, with suitable machinery, can be treated at a profit. Samples taken from the dumps mentioned yielded 5 per cent. and 5½ per cent. respectively, and sorted sample gave a return of 22½ per cent., which is a very fair average. Since operations have been started in this portion of the mine, there have been dispatched about 25 tons of ore, the highest averaging 18 per cent., and the lowest 11 per cent.; also in that time a considerable amount of work has been done, such as erecting machinery, unwatering the mine, and repairs to the underground works; consequently, the ore-raising has only occupied a portion of the time. From the general appearance of the lode at the present levels, it is evident the further sinking of the main shaft should not be neglected, with the object of exploring the mine, and opening up more ground for working. (I.M.R., 4-4-00.)

In a further report, dated December 10th, 1902, the inspector states that since his previous report a considerable amount of development work had been done, and the erection of the dressing plant, consisting of rock-breaker, and Root and May's jiggers completed satisfactorily. The main shaft had been sunk a further depth of 156ft., making a total distance of 366ft. on the lode incline. At the 300ft. level a chamber was opened, and a drive made N towards No. 2 shaft 54ft.; the lode for the first 26ft. being about 4ft. wide, containing ore of very fair value; at this point a slide or fault was met with, dipping S. at an angle of 45°. N. of the slide the lode contracted in width, and in the face was of low value, but in another 30ft. the drive would probably intersect a shoot of better class ore, which can be seen in the level above. The same slide was encountered in sinking the shaft 26ft. below the 300ft. level, but here the appearance of the lode has completely changed, the lode body making larger, and of much better quality underneath the slide than above. In the bottom the lode is the full width of the shaft, from 5ft. to 6ft., with about 4ft. on the hanging-wall side, worth from 8 per cent. to 10 per cent. copper, and in bulk the full width of the shaft should give a good average return. At the 198ft. level the N. drive has been extended 78ft., and connected with No. 2 shaft, a total distance of 150ft.; the lode formation ranging from 4ft. to 7ft. in width, but of rather low value, except at one point, about 80ft. N. of the main shaft, where a small, but good shoot of ore was encountered. A winze was sunk on this for a few feet, but as the shoot appeared only about 15ft. in length, work for the time was discontinued. From the 132ft. level a winze has been sunk, and connected with the N. drive at the 198ft. level, opening up large quantities of ore, which, with a slight increase of copper value, would pay to extract, now that the principal work of development has been done. The inspector further states his opinion that, for the future development of the property, it is absolutely necessary that the sinking of the main shaft should be continued for at least another 50ft., then open out a chamber at the 400ft. level, and drive on the course of the lode both N. and S.; it would also be advisable to resume the drive N. at the 300ft. level, and intersect the shoot of good ore mentioned as being in the level above 80ft. from the shaft, and at this point sink a winze, to connect with the proposed N. drive, at the 400ft. level. By this means, from present appearances, large quantities of fair-grade ore would be available for extraction. The improved value of the ore in the shaft bottom has every appearance of being of a substantial and permanent character, and fully warrants the expenditure required to carry out the work indicated, and bring the mine to a successful issue. (I.M.R., 10-12-02.)

In 1905 work was suspended on account of want of capital, and in January, 1907, the leases were sold to the Wallaroo and Moonta Company.

MEARS' COPPER PROSPECT.—Locality, section 58, Eurilpa. There is a lode formation of spathic iron and calcspar, with disseminated copper ore, striking N.W., carrying a small percentage of copper, which has been prospected by shallow shafts and open cuts. Further prospecting should be done.

MILDALTIE COPPER AND SILVER MINE.—Situating 260 miles N.E. from Adelaide, and 12 miles S.E. of the railway, in the district of Mingary, in a slightly undulating undisturbed belt of highly metalliferous country. The following particulars have been furnished by Mr. W. H. James, mining manager:—Mining operations started by the company and costeaning across the line of the strata (schistose rock) revealed three well-defined lodes with a strike N.N.E. and S.S.W., traversing the company's three 80-acre sections. In putting down a shaft in a strong, well-defined lode, 30ft. of sinking yielded 10 tons of 30 per cent. ore. The minerals near the surface were malachite and azurite, embedded in gossan, the latter worth 16ozs. silver per ton. At present bottom black sulphide is being raised. The full width of lode is not determined, but trenching on its course has shown it to be continuous in length. The lode improves in quality and size in depth, and the company has fully a mile of lode to work upon. Assays given by Government Assayer of samples supplied to him, gave—(1) copper glance, 5ozs. silver and $58\frac{1}{2}$ per cent. copper; (2) ironstone, $30\frac{1}{4}$ per cent. copper; (3) azurite, 6ozs. of silver, $19\frac{1}{4}$ per cent. copper; (4) malachite, $21\frac{1}{2}$ per cent. copper. (1890.)

A departmental report in June, 1907, states:—"Situating about 14 miles S.E. from Olary Railway Station. No operations were in progress at the time of my visit, and the old water shaft known as the Dalkey is full of water. This shaft, I am informed, is about 140ft. deep, and drives have been made from it. The old spoil heaps show that copper and silver-lead ores have been extracted. The country rocks are diorite and slate. A short distance to the S. two shafts have been sunk on a vein of quartz and copper ore, striking N.N.E. The N. shaft could be descended, and here the vein appears well defined, and is from 1ft. 6in. to 2ft. thick at the bottom (40ft.), where a short drive N. has been made. A general sample composed of quartz, copper pyrites, and bornite assayed 7.7 per cent. copper. Indications are sufficiently favorable to warrant the prospecting of the ground at depth, and for this purpose the sinking of the shaft examined should be continued." (D.R. (Gee), 22-6-07.)

MOCHATOONA MINE.—Locality, about 3 miles N.N.E. from Angepena Station. This mine was formerly considered a wonderful discovery. For some time men were employed there, but the mine workings were eventually abandoned. Prospected from 1860 to 1869. Intermittent work has been carried on here recently. (1907.)

Inspector Jones reports—There are a great number of lodes traversing this property of various thicknesses—from 1ft. to 5ft.—and consisting mostly of iron and little quartz, all carrying a quantity of green carbonate of copper. The general trend of both the lodes and country rocks is N. and S., dipping W. with few exceptions. The greater number of the lodes are in the slate beds, and are the best as regards carrying copper ore. The principal work carried on was on the side of one of the hills, where a tunnel has been extended for a distance of 120ft., following the course of the lode, which is of a uniform thickness of 1ft., and showing high-grade copper ore in places. On the side of the hill, a little way up from the tunnel, on the same lode some very good copper ore was got from the open cut. Some of the ore sent away from here has given as high as 25 per cent. In bulk it will go about 4 per cent. Small patches of sulphide have been got in the lode at times. Considering the number of lodes on this property, all showing good indications of copper, I am of the opinion that it is a very promising show, and warrants vigorous developmental work being carried on to prove the value of these lodes at greater depth, where some good grade sulphide ore may be discovered. (I.M.R. (Jones), 22-8-07.)

MOCHATOONA NORTH MINE.—Two shafts have been sunk on the property to a depth of 40ft. vertical, and securely timbered. Both the shafts are within 100yds. of a creek, which, after the heavy rain had running water in it, and, owing to the water percolating through the porous ground, both shafts were full of water to the level of the creek. Every effort was made by the proprietors to keep the water down by drawing water from the shafts with horses, but they had to give it up for a time. Their intention is to erect machinery as soon as possible. A sulphide

lode, I was told, was cut at a depth of 23ft. from the surface, which is from 3ft. to 4ft. wide; 9 tons of this ore was sent away, which gave the satisfactory return of 6 per cent. copper. (I.M.R. (Jones), 22-8-07.)

MONSTER LODGE.—This property is near the Wheal Ellen Mine, about 3 miles from the town of Strathalbyn. It consists of several mining sections, upon which a few miners worked for some months on tribute. (Austin, 1863.)

MONARCH'S HEAD.—Situated near Hawker, and held by a local company in 1896. A shaft was put down 55ft. through hard ground; but softer country came in, and carbonates of lime and copper, and manganese and a small vein of asbestos were met with.

MONARCH (PARKHILL'S CLAIM).—Situated in the Illinawortina Pound, about 2 miles N. 10° E. from Dean Hill. A shallow pit on the side of the hill exposes a lode 15in. to 18in. thick of ferruginous quartz and iron gossan, with kaolin and blue and green carbonates of copper. Small specks of gold are found in the quartz, in the gossan, and also with the copper ore. The vein strikes N. 55° E. and seems to underlie N.W. at about 50°. Fifteen chains E.N.E. from this place a trench, 12ft. long and 10ft. deep, has exposed a lode about 4ft. wide, strike S. 85° E., and underlie S. of 50°. It is composed of quartz and iron gossan containing green carbonate, ferruginous copper ore, and a little copper sulphide; specks of gold also occur in the copper ore here. The veins cannot be traced far on the surface. The country rocks are crystalline limestone containing pyrites and calcareous slate. (George, 27-2-04.)

MONTACUTE MINE.—Situated on the Mount Lofly Range, and about 10 miles nearly N.E. from Adelaide, is one of the oldest mines in the colony, having been discovered in 1843-4. The mine is on a steep spur of the range, and extensive outcroppings of ore were visible on the surface. The ores found were chiefly yellow and peacock ores, averaging 18 per cent. Some native copper was also found. (Austin, 1863.) In 1848 the quantity of ore raised was about 1,500 tons; the quantity shipped about 1,000 tons, and the highest price realised in Swansea about £18 per ton. In 1846 the Customs returns gave 503 tons of ore as exported from this mine. Work was stopped by the discovery of the Victorian goldfields in 1851 withdrawing all the miners. In 1898-9 the mine was again worked for a time, and some tunnels were driven in from the N. side of the spur.

MOOLOOLOO MINE.—Situated 28 miles N.N.E. from the Blinman. This discovery was tested by a company, but the ores were not sufficiently rich to pay expenses of cartage to smelting works, 30 miles distant. Reports mention that on the hill is a "boil" capped with iron and manganese, showing good ore in several places. Worked from 1860 to 1869, but very little work was done. Working has recently been resumed, and the six months' return to end of 1898 shows that a ton and half of ore yielded 7cwts. of copper. Two shafts are down each 25ft. (1899.)

MOOLOOLOO MINE SOUTH.—Locality the same, and description similar to that of Moolooloo Mine proper. Operations conducted from 1860 to 1869.

MOONTA MINE.—*Vide* WALLAROO and MOONTA, page 140.

MOOROO MINE.—Situated a few miles to the W. of Prism Hill. The indication leading to the discovery of this mine was a hill stained with copper from top to bottom, but the only work done was the sinking of two shafts to the depth of 6 and 8 fathoms respectively. About 20 tons of ore were raised, but the water coming in strongly, and no promising lode being found, operations were discontinued. (Austin, 1863.) A good deal of work has been done here during recent years, and a quantity of low-grade ore raised by the Tasmanian Copper Company and forwarded to their Blinman smelters. (1907.)

MOOROWIE COPPER MINE.—Situated on the Arrowie run, on an E. flank of the Flinders Range, about 100 miles from the Hawker Railway Station. The Inspector of Mines reported (September, 1889)—An outcrop, running N.E., with an underlie to the N.W., has been opened upon in several places, and small bunches

of good copper ore was found distributed irregularly in a ferri-calcareous formation. A shaft has been sunk 100ft. on the lode, which varies from 3ft. to 4ft. in thickness. The ore is of excellent quality, the company's assays have ranged up to 79 per cent., and the Government Assayer's return on samples tried reached as high as 64 per cent.

A recent report states :—There is one well-defined lode running through the property, N.E. course, with sharp underlie to the N.W. It is a ferri-calcareous formation, containing green and blue carbonate of copper, with little grey ore in places near to the surface. Its thickness varies from 2ft. to as low as 3in. The outcrop is very consistent, and can be traced for over half a mile on the surface, and shows strong indications of copper all along the line. Most of the work has been done on the second N. block, where a shaft, 7ft. by 5ft., has been sunk on the underlie of the lode to a depth of 100ft. The best of the ore seems to have been located near the top of this shaft in the soft country, where the ore has been stoped out N. and S. for about 50ft. and to a depth of 30ft. There is little grey ore showing in the faces of these drives at present, which may improve in thickness if driven on further. From a depth of 28ft. down the shaft the formation is gradually making smaller, until at the 60ft. and below that there is only about 3in. of formation between the true walls, with little green carbonate of copper entering both walls to a depth of 6in. or 9in. in places. Considering that the lode is small and in hard country I do not think stoping ore out at this depth could be made profitable. Five samples of ore from the different levels gave the following results :—No. 1, bulk sample, 60ft. level, 4.1 per cent. copper ; No. 2, 40ft. level, 2.9 per cent. copper ; No. 3, 40ft. level, 10.9 per cent. copper ; No. 4, 70ft. level, 2.2 per cent. copper ; No. 5, ore dump, $1\frac{1}{2}$ tons, 38.1 per cent. copper. About 300yds. N. of the main working shaft a prospecting pit had been sunk to a depth of 10ft., the formation at the top of which is from 9in. to 12in. thick, and consists of blue and green carbonate of copper, and at the bottom, from 2in. to 3in. wide. (I.M.R. (Jones), 28-8-07.)

MOUNT BOLD.—E. of Clarendon, hundred of Noarlunga. The Inspector of Mines (Mr. Rosewarne) in 1889 states a shaft has been sunk 145ft. At 60ft. depth a fair lode was exposed with an E. and W. course and S. underlie. On the hanging wall there is a branch of fair-grade yellow and peacock copper ore, and the lode will yield about a ton per fathom of ore dressing up to 20 per cent. Assays for silver gave 22ozs. per ton. The surrounding country is clay slate. There is a large extent of copper-bearing ground, and there is plenty of water available for dressing machinery. Even at the present (1889) low price of copper, he was of opinion that the mine might be worked to give a margin of profit. In June, 1894, the mine was being worked on tribute, and it was stated that some good peacock ore had been taken out, and that the lode gave a ton of ore per fathom, dressing up to 20 per cent. for fine copper, the assay showing also 22ozs. of silver per ton. The mine has been worked from time to time in a desultory sort of way. Small operations are now in progress, and Inspector Matthews, in April, 1907, reports :—“This property (now called the Mount Bold Perseverance) is situated about 5 miles from Clarendon, in the vicinity of Mount Bold. The principal workings consist of one shaft and two tunnels, the two latter being driven on the line of lode, which shows from 6in. to 2ft. wide. The main shaft has been sunk near the top of the hill to the depth of 80ft., disclosing vein matter ranging from 6in. to 2ft. wide, composed of schist, gritty kaolin, and iron gossan, freely copper-stained, with nodules of good copper in places in the form of green carbonates and malachite. About 60ft. below the surface level of the shaft a tunnel has been driven 134ft., and connected with the shaft 20ft. from the bottom, vein matter being similar in appearance to that previously described. The lower, or No. 1, tunnel has been advanced 250ft., lode formation being broken slate and kaolinised matter, containing splashes of green and blue carbonates of copper ; but, taken in bulk, is of little or no value beyond showing that the lode formation is in

metal-bearing country, and possibly might improve in value as the tunnel is continued. To further prospect this property I see no other course but to continue the bottom tunnel another 50ft. or 60ft., which would be underneath the upper workings, then continue sinking the shaft until it is connected with the tunnel. This would be simply prospecting work that, from the character of the vein matter, may develop more valuable shoots of ore than are at present exposed, which, taken in bulk, are not by any means remunerative. Four samples taken returned the following results:—No. 1, sorted sample, opening near shaft, ferruginous quartz and malachite, 2.6 per cent. copper; No. 2, sample main shaft, quartz and malachite, 1.1 per cent. copper; No. 3, ore raised from top tunnel, quartz, malachite, and azurite, 1.1 per cent. copper; No. 4, nodules and splashes of copper picked out in driving bottom tunnel, 4.9 per cent. copper.” (I.M.R., 6-4-07.)

MOORAHNOO.—Adjoining the Montezuma Mine, 4 miles from Tumby Bay. A shaft has been sunk to a depth of 43ft.; the lode formation is from 6in. to 12in. thick, and contains blue and green carbonates; at the bottom the vein shows considerable improvement, and it is recommended that the shaft be continued for another 40ft. or 50ft., and drives put along the course of the lode. Sample taken assayed 18 per cent. (I.M.R., 5-9-99.)

McCABE'S.—Situated about 7 miles N.E. of Wildman's Bluff. Small veins from 4in. to 10in. thick, consisting of quartz, spathic iron, siliceous limestone, containing small nodules of copper glance, sulphide, and carbonate, with also small spangles of native bismuth; these strike N. 12° E. and underlie E. at 65°, and have been opened by a trench 70ft. long, 6ft. deep, and a pit 17ft. deep. The country rocks are clay and calcareous slate. (George, 24-4-04.)

MOLLER AND RANKINE'S CLAIMS.—E. of and adjoining the Black Queen Mine. A pit has been sunk on a vein of argillaceous material and iron oxides, 4in. to 8in. thick, containing small lumps of copper sulphide and stains of carbonate; a little calcespar shows at the bottom. The vein occupies the junction between mica schist and massive green hornblendic rock, and is worth testing at depth. (24-4-04.)

MOUNT BURR MINE.—This mine is situated about 20 miles E. from Lyndhurst Railway Siding. The rock of which the mount is composed, and mainly also the spur on which lies the mine, is a coarse quartz grit, silicified and concretionary in places. It therefore assumes an appearance similar to that of the cupriferous outcrop of the Ooraldana Mine. Shallow shafts have been opened on the spur, and the ore, according to specimens lying about, consists of earthy-green carbonate, with some chloride, and occasionally blackish grey, and, more rarely, red oxide of copper, associated more or less with brown hematite. The main ore-bearing part of the mine lies close along the boundary of the quartz grit and calcareous slate. This slate is also ferruginous and concretionary in part, and strikes E. 35° N., and dips N. 35° W. at 40° to 50°. The principal workings consist of a tunnel about 4 chains in length, starting from a small gully. In this tunnel are exposed, interstratified with the slate beds, brown iron ore, richly and intimately impregnated with grey oxide and green carbonate of copper. This lies in thin layers, the thickest of which is not more than 3in. The walls, which are rather soft, contain green carbonate, mixed with chloride of copper; they also show glistening crystalline particles and thin veins of selenite. Further in, where the tunnel takes a strong bend to the S. is to be found on the face a large pocket of ochreous brown iron ore. (Ulrich, 1872.)

The Inspector of Mines (Mr. W. H. Matthews) reports as follows:—

Situated close to Mount Burr. The workings are in a spur of the main range, rising abruptly 80ft. above the level of the watercourse which runs at its base. The formation on the surface is apparently very large, copper showing from various openings, from 4 chains to 5 chains in width. Strike about N. and S. The work that can be inspected is almost all confined to surface openings, from 4ft. to 12ft. in depth, exposing a large quantity of low-grade material, composed of coarse gritty quartz and sandstone, containing green carbonates and grey ore,

associated with iron, portions of which can be hand-dressed to a very fair percentage. From one of the openings 10ft. wide and 5ft. deep, a bulk sample was taken, and gave $5\frac{1}{2}$ per cent. of copper. Sixty feet from the outcrop a shaft has been sunk to the depth of 50ft., passing through garnet sandstone, with small seams of ferruginous matter, but no copper as yet. This shaft should be continued at least another 30ft., and the ground then prospected by crosscutting, which should be 110ft. below the highest point of the surface workings. The ground being soft, the expense would be comparatively small. On the E. side of the hill a tunnel has been driven, and shaft sunk in soft white decomposed slate, containing patches and pockets of carbonates and grey ore. The workings had fallen in, and could not be examined, but the inspector was informed that several tons of high-grade ore had been extracted. About a quarter of a mile E. of the present workings a water shaft, 8ft. by 4ft. in the clear, was in progress, then 35ft. deep, and, judging from the position, water to supply the proposed concentrating plant should be struck at a shallow depth. Concentration of the ore is absolutely necessary for the future working of the mine, which has every reasonable chance in its favor. Twenty-seven tons of ore, worth a little over 30 per cent., had so far been sent away. (I.M.R., 22-11-99.)

Attempts to work this mine on a large scale and erect concentrating machinery, etc., have not been successful so far. Tributaries have been on the property recently and have realised fair returns, but deeper workings are now necessary. Vanadium ochre, in small quantity, has been found in the ore here. (1907.)

MOUNT CHAMBERS MINE.—Situated 6 miles S. from the hill of that name and 32 miles E. from the Blinman. The surface of the ground is covered with boulders of crystalline limestone. Several large blocks of malachite were found in a clear space, running N. and S. between the boulders, and green carbonate is scattered about. There is no regularly defined lode, but blocks of ore were found in three different parts of the section. The country is moderately hard pipeclay. Several shafts were sunk in search of a lode, but without success. (Austin, 1863.)

MOUNT COFFIN MINE.—Distant about 8 miles N.E. from Leigh Creek and about a mile S.E. of the Mount Coffin Trig., on the side of a steep hill. The lode runs almost E. and W., and carries a small but rich quantity of ore composed of chalcocite, malachite, and atacamite in a much-jointed slate. The dip is S. 10° W. 65° to 70° . Two or three small shafts have been put down and an incline drive following down the shaft alongside the lode. The lode is traceable for about 2 miles on the surface, and the underlie is about 2ft. in 6ft. to the S. About 78 tons of ore have been raised, but it is very dredgy, and requires machinery to dress it. The mine stopped working in 1883.

It was restarted, and Inspector Matthews reports:—

The lode is persistent, and has been worked by open cuts and shafts for fully half a mile in length, the deepest shaft being 80ft.; it ranges in size from a few inches to 3ft., and is composed of green carbonates and grey ore, running in seams and streaks throughout the formation, giving an average value of from 9 per cent. to 20 per cent. At the depth of from 12ft. to 15ft. the copper-bearing material usually gives place to barren rock, except at one point in the main shaft, where a vein of grey ore, 2in. thick, continues down to the 80ft. level. There is every chance of the lode opening out again, and the shaft should be continued to test this. At each end of the workings two shallow tunnels have been driven into the hill, one 60ft. and the other 80ft., but nothing of importance has been disclosed in either. On a second examination, in June, 1900, the inspector found 15 men employed, chiefly at the shallow levels; the formation was from 3ft. to 6ft. wide, carrying small veins and seams of green carbonate and grey ore. The country rock is, in places, highly copper-stained for a considerable distance on each side of the formation. During last 12 months 150 tons of ore, worth from 10 per cent. to 35 per cent., had been raised. (I.M.R., 29-6-00.)

A departmental report, dated August 27th, 1902, states—This mine was worked years ago by a company; but for a considerable period it has either lain idle or been worked by tributers. Several shafts and inclined tunnels have been sunk, but the old shafts are not now accessible. The recent work done by tributers consist of a shaft sunk 21ft. vertically and then 80ft. on the underlie, with a drive E. at the bottom 12ft. long. Very little copper ore was obtained at this working, although the country passed through was heavily stained with copper carbonates. A shaft was in course of sinking, and at the time of inspection was 25ft. deep, following small seams of rich copper ore, while at the W. workings a shaft had been put down 40ft. following a vein consisting of cuprite and chalcocite, with a little copper carbonate, from 1in. to 8in. in thickness. Numerous other small pits and costeans have been sunk, and in every instance copper ore has been met with. The copper-bearing formation consists of clayslate containing strings, veins, and bunches of cuprite and copper glance. Small veins, varying from $\frac{1}{4}$ in. to 1in. in thickness, cut across the clayslate formation at about right angles to its strike and underlie down along the formation at a very flat angle; in the neighborhood of these, bunches of rich copper ore are met with. The thickness of this copper-bearing formation has not been determined, but copper ore has been proved to occur for over 15ft. The formation strikes W. 10° N., and underlies S. at an angle of about 80° . For the first five months of 1902 about 17 tons of ore were raised and sent to the smelters by the tributers. (27-8-02.) A little alluvial gold has been found in the adjacent gullies. Operations are now being prosecuted more vigorously. (1907.)

MOUNT DECEPTION.—Between Beltana and Wirtaweena mines six mineral sections were taken up for mining purposes. They yielded some fine specimens and nothing more. (Held between 1860-9.)

MOUNT DESIRE.—In the neighborhood of this hill, which is situated about 13 miles S.E. of Mernmerna, on the Great Northern Railway, two mineral claims were taken out. They were W. of the mount, at distances of 3 and 8 miles respectively. Very little work was done upon them, though the mineral indications were considered good. (Date of prospecting, 1860-9.)

MOUNT EMILY MINE.—Situate 11 miles due S. from the Blinman and 5 miles from the mount itself. It is near the top of a small conical hill. The work is represented by a small excavation opened in a calcareous, mullocky shale, which is permeated by green carbonate and chloride, and contains scattered specks and small seams of grey oxide of copper. There are also present irregular roundish lumps of crystalline limestone, which, on being broken, show copper coloration throughout. Resting on this deposit, and forming the top of the hill, is an impure limestone, which apparently dips at an angle of 50° or 60° N. The cupriferous shale seems to form an interstratified layer between limestone deposits. A bold outcrop of quartz commences about 10 chains N.E. from the excavation, striking N. 20° E., and dips nearly vertically. Copper stains and coatings show here and there; but the principal ore enclosed is galena in thickly scattered specks, small patches, and occasionally in veins. Two other outcrops are close at hand, but neither of them show copper stains or lead-ore impregnation. The country between these reefs consists of indurated calcareous shales and slates, with interstratified bands of hard limestone; the strike is nearly E. and W., dip N. at 50° to 60° . These rocks, judging from fragments scattered on the surface, seem to be traversed in the vicinity of the mine by small dykes of diorite greenstone; and about a mile S., on the slope of a range, is a massive outcrop of the same rock. This should receive the attention of the prospector, for the reason that in Victoria dykes of this rock are traversed by auriferous quartz veins. Some of the richest mines in that colony are working on similar dykes. (Ulrich, 1872.)

MOUNT EURO MINE.—Situated amongst high and rugged hills, 28 miles N.E. from the Blinman. A heavy reef of quartz and ironstone carries strong green and blue stains of copper, with occasional small pieces of ore; and in one place some good specimens of grey oxide were found. No work has been done on this section. (Austin, 1863.)

MOUNT FITTON MINE (also known as "Billy's Springs Mine").—Situated 7 miles N.W. of Mount Fitton. There is a large outcrop of limestone intermixed with arenaceous sandstone, iron, and nodules of copper, galena, and impure cerussite. It has a strike 20° N. of W., and is about 15ft. wide. The Inspector (1890) reported a shaft 40ft. deep in the lode, and a drive to cut the footwall. Sampling from the lode gave good returns of silver and lead. Further sinking and testing were recommended. In December, 1897, it was stated by the owners that one shaft had been sunk to a depth of 100ft. (timbered), which cut through the lode at about 30ft. Ore from this lode assayed in 10 samples over 30ozs. silver per ton and 50 per cent. of lead, whilst a copper vein assayed 22ozs. silver per ton and 32 per cent. copper. There is an outcrop of yellowish ore carrying carbonates and grey copper ore. The Government Geologist, in February, 1899, reported that there is a wide lode formation which has been worked to a depth of 56ft., and that a shaft was sunk 100ft., when work ceased. The favorable character of the lode at the 50ft. workings would lead to the expectation of improvement at depth.

A departmental report, furnished in April, 1904, says:—Lode material consists of gossany, siliceous, argillaceous, and ferruginous matter, containing seams and bunches of copper glance, carbonate of copper, and carbonates of zinc and lead, with silver. The outcrop is exposed for a length of about 70ft., with a surface thickness of from 10ft. to 15ft.; it strikes S. 65° E. Shafts have been sunk at each end to 18ft. and 16ft., and connected by a drive at the bottom, which has been extended E. from the E. shaft for 20ft. All this work is in lode matter. At about 45ft. E., along the line of lode from these workings, a main vertical shaft has been sunk to a depth of 100ft., and close timbered to within 6ft. of the bottom. At 43ft. from the brace drives have been put in along the lode E. 25° S. for 27ft., and W. 25° N. for 11ft. In the E. drive the lode matter is exposed over 8ft. wide, with neither wall visible; it consists of gossany material, with a little quartz and carbonate and a quantity of both decomposing and hard siliceous slate. Similar lode matter is exposed in the W. drive, and at the face a crosscut W. has in 5ft. reached a vertical wall. From the bottom of the shaft a crosscut has been made, N. 20° E., for 64ft. through limestone rock, without meeting any lode material. A trench, 24ft. long, 13ft. deep, and 3ft. to 4ft. wide, has been excavated 30ft. to 54ft., entering along the lode from the main shaft. Good returns, particularly as regards zinc, have been obtained from sample parcels recently treated, and two samples taken from the dumps at the time of inspection assayed—No. 1, smithsonite, malachite, oxide of antimony, with siliceous gangue; gold, trace; silver, 5ozs. 12dwts. per ton; copper, 10.2 per cent.; zinc, 36.7 per cent.; antimony, 7 per cent. No. 2, smithsonite, malachite, and oxide of antimony; gold, trace; silver, 2ozs. per ton; copper, 6.5 per cent.; zinc, 20.5 per cent.; antimony, 1 per cent. This is evidently a property which should be vigorously prospected, and is of special interest owing to the amount of zinc contained, as shown by the above assays. (George, 24-4-04.)

Two and a half tons, returning 42.7 per cent. zinc, have been recently treated. (1907.)

MOUNT FITTON SOUTH.—Situate $2\frac{1}{2}$ miles S. from Billy's Springs. Mr. Harrison, prospector, reported to the Mines Department (September, 1898) that he and his mate had struck, at a depth of 47ft., a solid body of copper ore in a lode 4ft. wide. Four small parcels had been sent away, averaging $48\frac{1}{4}$ per cent. Other parcels sent for treatment by the E. & A. Copper Co., over 11 tons, gave $52\frac{1}{2}$ per cent., and about 7 tons gave $42\frac{3}{4}$ per cent. The prospectors stated that they have a large body of ore, but the great cost of transport retards development of the mine. The Government Geologist reported in February, 1899, that the strike of the lode is N. and S., and the inclination 53° E. The shaft has been sunk to a depth of 60ft., following the dip of the lode. At the depth of 50ft. there is a drive 30ft. long. There is no doubt about the existence of a rich shoot of ore, which will probably continue downwards to a considerable depth, and the sinking of the

shaft should be continued, and the lode proved by levels driven at suitable intervals of depth. The tailings from the jigged ore showed on pan test fair prospects of gold, and samples of tailings assayed gave the following results :—

Gold.			Silver.			Copper.
dwt.	grs.		dwt.	grs.		per cent.
2	0	.....	2	21	.....	13·2
1	17	.....	3	23	.....	10½
5	10	.....	6	0	.....	18½
1	3	.....	4	13	.....	15½
2	7	.....	4	5	.....	12½

The Inspector of Mines reports—A shaft has been sunk to a depth of 70ft. on a copper lode, which strikes N. and S., and underlies to the E. at an angle of 53°. The lode formation is from 4ft. to 5ft. wide, and near the surface the solid ore vein is 12in. thick, making larger as it continues down, until at the bottom, or 70ft. level, it is 4ft. thick, consisting of green carbonates and grey ore. A bulk sample taken assayed 29½ per cent. of copper. At the 50ft. level there is a small drive about 30ft. long, the ore face still showing 3ft. wide. In other parts of the property shallow pits have been opened on various lodes and veins, in every case exposing green carbonates and other ores, so far not developed. There is no doubt the main shaft is sunk on a strong rich shoot of ore, that will probably continue to some considerable depth, making, in places, larger and smaller. Up to the end of April, 1899, nearly 100 tons of ore, giving the high average of 48 per cent. of copper, had been sent to the smelters; 18 to 20 tons of low-grade ore, worth concentration, were at grass. On the reserve W. of and adjoining the mine a well, sunk to a depth of 60ft., yields a supply of 600galls. daily, which could doubtless be increased by sinking. (I.M.R., 1-8-99.)

Reporting in July, 1900, the Inspector says that work had been continuous for the last 12 months, and consisted chiefly of raising ore from the main shaft, which had been sunk to 112ft. on the lode underlie. The operations then were confined to the 50ft. level, where ore of very high grade was being stoped; the ore vein ranges from a few inches to 2ft. thick, and the main shoot apparently dips to the N. The shaft could not be examined below the 50ft. level, but it was stated that the formation was from 3ft. to 4ft. wide, with veins and bunches of good ore throughout. Similar-looking lode outcrops which occur on the property should be opened up, but so far no work had been done to test them. (I.M.R., 3-7-00.)

An examination in July, 1901, showed a considerable amount of work in progress at the 25ft., 50ft., and 92ft. levels in the main shaft. The ore-bearing bodies have been found to be much more extensive than had been anticipated, as, on the supposed walls being broken through, fresh copper-bearing veins were disclosed, and at the 92ft. level the lode has been proved for 13ft., with neither hanging nor foot wall disclosed. A drive N. along the lode extends for 63ft. from this level. In the upper levels also the lode is much wider than had at first been thought. Near the W. boundary of the property a shaft has been sunk 22ft. on a quartz lode parallel to the main lode, and with an underlie to the E. of 56°; it is about 2ft. thick and carries grey ore and green carbonate, and should be thoroughly prospected. There are also four other lode outcrops on the leases which should be prospected. (George, 5-7-01.)

In August, 1902, it is reported that the drive N. from the 92ft. level, being met by an adit from the outside, communication with the surface on the side of the hill has been made, the total distance being 251ft. Rich copper ore was followed for 65ft. from the shaft, when the vein seemed to cut out, but between there and the mouth of the tunnel copper stains are showing on both sides of the drive. Drives have been extended and various stopes worked, but operations on the mine have not been continuous. (George, 27-8-02.)

Further report, March, 1904. No work had been done in the mine since last report, but a well had been sunk 50ft. in the south bank of the Hamilton Creek, and a supply of 4,000galls. of good water per diem obtained, and a concentrating

plant had been obtained by the company and was in course of erection. It is proposed to start work on the dump, which is estimated to contain 1,600 tons of ore, averaging $7\frac{1}{2}$ per cent. metallic copper. (George, 4-3-04.)

Returns for the six months ending December 31st, 1906, show that 200 tons of ore, containing 6 tons 11cwt. of copper, value £497 7s. 2d., had been raised.

MOUNT FITTON CONSOLIDATED.—Situated S. of and adjoining the Mount Fitton South Mine. A small opening 3ft. deep, has been made, showing strong copper stains. Not enough work done for determination. Further prospecting recommended. (I.M.R., 1-8-99.)

MOUNT GRIFFITHS MINE.—This venture adjoins the W. boundary of the Fifth Creek Central, and a large amount of work has been done; but the Inspector of Mines is of opinion that there is no prospect worth following, although in one gully near the boundary a fair quantity of carbonate of copper has been opened up. Still, the property is in a mineralised belt of country, and a drive to intersect the central lode at 500ft. would fully prove it. (1889.)

MOUNT GUNSON COPPER MINE.—Situated about 90 miles N.W. from Port Augusta, and 1 mile W. from Pernatty Lagoon. There are two lodes, bearing N.E. and S.W., and ranging from 6ft. to 18ft. in width. The ore consists of green and blue carbonates and grey ore, containing about 26 per cent. of metal. The work done includes five shafts from 10ft. to 25ft. deep and surface prospecting; and about 40 tons of ore, averaging 20 per cent. copper, has been raised, besides 200 tons low-class ore suitable for concentrating. This mine has been worked by a small syndicate, but operations were suspended because of the expense of cartage and scarcity of good water. The ore has been raised from an almost horizontal deposit, varying from 1ft. to 3ft. thick. Some of the ore by assay gave 18ozs. silver. The veinstone associated with the metallic mineral is quartz, and the country rock is sandstone and slate. The mine was discovered about the year 1875.

Further finds of copper ore were made between the old mine and Pernatty Lagoon. The Inspector of Mines, reporting August 4th, 1899, states that from present developments the copper-bearing formation has every appearance of a horizontal deposit, but sufficient depth has not been attained to determine that point. At this time the principal work was confined to block No. 1264, near the centre of which an open cutting was being worked, 20ft. long by 12ft. wide, and an average depth of 10ft., the deepest point being 18ft. No clean or well-defined walls were visible. The material sunk through was chiefly horizontal bands of green carbonates, from 6in. to 3ft. 6in. thick, with intermediate low-grade belts, and, at the deepest point, iron-stained kaolin, containing small seams of high-grade carbonates, grey ore being visible in places. A sample taken from the bands of ore, from surface to bottom, gave a return of $15\frac{1}{2}$ per cent. copper. At shallow depths, from 2ft. to 16ft., a considerable amount of work was formerly done in block 1244, exposing a large quantity of green carbonate material, a sample from which returned $7\frac{1}{2}$ per cent. copper, and at the depth of 12ft. or 15ft. this gave place to low-grade slaty matter. This will probably not last, and further bands of good ore should be met with deeper. In block 1291 the copper-bearing formation shows plainly on the surface for a considerable length and width. About the centre a small shaft has been sunk to the depth of 15ft., the ore body lying in horizontal bands composed of dolomite, quartz, and iron, containing green carbonate and a little grey ore; average return 4 per cent. copper. Throughout the various blocks a large number of cross trenches and trial pits, from 2ft. to 5ft. deep, have been sunk, and in almost every instance more or less copper-bearing material is exposed, and generally, although the developmental work has been small, and so far extended only to shallow depths, a large quantity of copper-carrying matter has been shown to exist, of which the higher grade can be sent direct to the smelters and the lower, with suitable machinery, dressed to a standard, giving profitable and regular returns. It was stated that during the previous six months 50 tons of 14 per cent. ore had been dispatched. (I.M.R., 4-8-99.)

shaft should be continued, and the lode proved by levels driven at suitable intervals of depth. The tailings from the jigged ore showed on pan test fair prospects of gold, and samples of tailings assayed gave the following results :—

Gold.			Silver.			Copper.
dwt.	grs.		dwt.	grs.		per cent.
2	0		2	21		13.2
1	17		3	23		10½
5	10		6	0		18½
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The Government Geologist having visited the property in July, 1900, and October, 1901, furnished the following report:—Locality, Pernatty Lagoon, 5 miles S.S.E. of Mount Gunson trig. hill.—At the old Mount Gunson Mine copper ore occurs permeating beds of quartzose sandstone, lying approximately in a horizontal position, to depths of from 5ft. to 15ft., as proved in open cuts and shallow tunnels. The copper when in solution has been infiltrated into the sandstone beds, and it has penetrated through the mass. The result is that the sandstone is highly charged and generally colored green with carbonate, while the joints and cracks are often filled with carbonate and copper glance. A considerable quantity of low-grade ore is exposed in the cuttings, which extend over about $\frac{1}{2}$ an acre. The limits of the copper-bearing rock are not yet determined either in depth or laterally. At Brennan's workings, 30 chains W., shallow holes in a gully on about the same level as at the old mine have proved the existence of what appears to be the same copper-bearing stratum. At Brennan's shaft, 30 chains E., open cuttings and a shaft 70ft. (?) deep show similar copper-bearing sandstone overlying a clay bed. A tunnel connecting these workings with the shaft has exposed a soft copper-bearing gossany formation, which has the appearance of a flat lode. An assay of some of this material taken by me returned a trace of gold and 12 $\frac{3}{4}$ per cent. of copper. As dolomitic limestone is met with in the shaft below this level, the deposit may mark the junction of the dolomitic limestone and the sandstone. E. of Brennan's shaft to the edge of Pernatty Lagoon numerous shallow shafts have been sunk in dolomitic limestone, containing green carbonate of copper and copper glance in small veins, disseminated in some places sparingly, in others richly, through the rock. Baryta in small veins is sometimes found accompanying the ore. The shafts or holes are sunk at places where the ore was noticed in the dolomite, and judging from the number of places which have been tried it must be rather widely distributed. No limits as to depth or extent have yet been determined. The dolomitic limestone underlies the sandstone formation, and may be the source from which the copper deposited in the sandstone was leached. It is highly probable that the dolomite will be found to contain copper lodes, and although this rock has only been proved copper-bearing to a depth of a few feet, it will probably be found to extend to greater depths when tested. The same remark applies to the sandstone formation. With regard to the area likely to be copper-bearing, ore has been already found to occur for the whole distance occupied by the mineral leases, viz., 2 miles in length. It most probably extends downwards to a greater depth than has yet been tried. A systematic prospecting by means of shallow bores would determine these points. The average ore is of low grade, but at the same time rich ore can be picked out. Taken altogether, the deposit is a remarkable one, because of its bedded character and the extent of rock affected. With concentrating machinery of a suitable character, and management on a large scale, very large returns of copper should be obtained. (July 11th, 1900.)

On October 26th, 1901, this mine was again visited, at which time it was not being worked. The copper-bearing quartzite and sandstone rock had been located over a wider area, but no extensive and systematic mode of working the deposits as a whole had then been attempted.

In 1905 the Mount Gunson Company expended a considerable sum in the erection of a reverberatory smelter; but mainly owing to the highly siliceous nature of the ore and the excess of silica in the ironstone flux available, the smelting operations were not successful. Some other means of dealing with these large bodies of low-grade ore will probably be adopted.

MOUNT BAYLY.—Situated about 6 miles N. of Beltana, and $\frac{1}{2}$ mile E. of the railway line. Three shafts have been sunk to various depths, and various small openings made in a soft clay formation about 30ft. wide, with, so far, no defined walls, carrying more or less blue and green carbonates, in nodular form, throughout. From No. 1 shaft, 86ft. deep, a drive has been made on the course of the formation

for 50ft. ; this exposes blue and green carbonate in places, but the bulk is not of high value. No. 2 shaft is 60ft. deep, and about 70ft. of driving has been done ; the material raised has been treated by a small dressing plant, erected at some springs away from the mine, but the result was not successful, partly in consequence of the very tenacious nature of the clay formation through which the copper is distributed being very difficult to deal with by the ordinary ore-dressing appliances. No. 3 shaft is 63ft. deep, with a crosscut driven 30ft. at the bottom ; this, in places, shows small splashes of good copper ore, but taken in bulk is of poor quality. There are several other openings, from 4ft. to 20ft. in depth, in most cases showing the same class of material, the copper contents being of rather better value near the surface than at the deeper levels ; but it is evident that a special class of dressing machinery will be required to obtain anything like a fair extraction. Three tons of 8 per cent. ore and 7 tons of concentrates from the machinery, worth about 10 per cent., have been sent away. Bulk samples from the various workings assayed as under :—

Bottom of No. 1 shaft.....	$\frac{3}{4}$	per cent.
No. 2 shaft.....	$1\frac{1}{2}$	"
No. 3 shaft, partly sorted.....	$1\frac{3}{4}$	"
No. 3 shaft, bulk.....	3	"
Opening, 20ft. deep.....	$2\frac{1}{2}$	"

(I.M.R., 16-8-00.)

MOUNT ARDEN—Situatd 18 miles N. of Quorn, on the top of a low ridge. The surface shows a considerable quantity of sheddings from a large N. and S. ironstone formation which runs through the property. For about 200yds. in width copper traces can be seen, the better portion being on the E. side of the ironstone outcrop. The workings consist of numerous small openings and several prospecting shafts, ranging from 10ft. to 70ft. in depth ; these nearly all expose small veins and bunches of copper ore, but no true lode or vein has yet been found. Work was in progress in an opening 10ft. deep, disclosing a horizontal formation 3ft. thick, on a bed of ironstone ; the formation contains a large quantity of lime, and also shows blue and green carbonates, grey ore, and small portions of malachite. A sorted sample assayed 53 per cent. ; below this a sample of black oxide of iron and limestone gave $1\frac{1}{2}$ per cent. About 500yds. N. two shafts have been sunk 10ft. and 20ft. ; the former, close to the ironstone, shows copper traces on the top, and should be continued to at least 50ft., and then crosscut through the formation. The second is sunk on a small vein of blue carbonate, which has continued almost vertical to the bottom ; this also should be continued. The country rock in both is soft sandstone and kaolin, and is favorable for ore veins or copper deposits. To prospect the property at the present workings, a tunnel should be driven from the E. side of the ridge, passing through the ironstone formation ; this would show whether a main lode existed. A shaft should also be sunk from the top of the hill, keeping close to the ironstone, and connecting with the tunnel ; this would pass through any horizontal deposits existing above the tunnel, and would afford facilities for their inexpensive working. The property is sufficiently promising to warrant the expenditure necessary to test its value. Twelve tons of 18 per cent. to 20 per cent. ore have been sent away. (I.M.R., 19-12-99.)

The Inspector of Mines made a further examination in July, 1900, and found that a considerable amount of prospecting work had been done, and several parcels of fair-grade ore sent away to the smelters. A tunnel had been driven 120ft. No regular or defined lode had yet been struck, and the tunnel should be continued further W., to intersect the principal metal-bearing strata. (I.M.R., 9-7-00.)

MOUNT LIVERPOOL MINE.—Situatd about 26 miles to the N. of Port Lincoln. According to Mr. Austin, some good ore was raised from it at different times, but owing to the hardness of the ground work has been long discontinued. (Austin, 1863.)

MOUNT McDONNELL.—Locality, Freeing Heights, N.E. from Yudnamutana. There are four lodes, striking E. and W., only one being worked upon at present. (1890.) Three shallow shafts have been put down, following the dip of the lode, which is 9ft. wide, without walls, and contains oxide and carbonate of bismuth, associated with carbonate of copper. Yield of bismuth, 19 per cent. to 60 per cent., and of copper, 20 per cent.—(A. Frost.) The secretary stated that three bags of ore weighing 4 cwt. 1qr., which were forwarded through Messrs. Harrold Bros. to the Royal Works, at Oberschelma, realised 500 marks, say equal to £24 10s. In 1890 the Inspector of Mines reported to the effect that this mine had been worked at intervals for years for copper, there being a large lode formation of spar and carbonate of copper in irregular blocks. The bismuth was found as a carbonate near the surface, but became a sulphide a few feet down, and was distributed throughout the lode formation to the extent of about 2 per cent., and with rough hand-picking gave 33 per cent. of metallic bismuth, worth at that time 11s. per pound.

MOUNT MARY COPPER MINE.—Situation, Parachilna Pass. The Inspector of Mines states that there is a N.E. and S.W. copper lode on section No. 11618, into which several openings have been made, and a branch of high-class ore exposed. No. 11666 has been prospected by a shaft and shallow tunnel. On No. 11619 a tunnel driven 90ft. into a hill has cut a big lode, coursing N.N.E. On this a shallow shaft has been sunk; several openings on the surface have revealed excellent prospects. An open cutting above these workings exposes a fine lode of copper of excellent grade. Hand picking can raise the average value of the ores to fully 35 per cent. Good supply of water and wood. Samples returned—(1), 41 per cent. of copper; (2), 38; (3), 35½ and 4dwts. 17grs. gold per ton; and (4), 36 per cent. and 4dwts. 12grs. of gold. (1889.)

MOUNT MULGA MINE.—Situating near Boolcoomata Station. The Government Geologist reported (December, 1896) an examination, stating that there was an extensive outcrop of baryta, extending N.W. and S.E. some 60 chains, and from 50ft. to 100ft. wide in places. It splits into veins at the ends, running through micaceous and quartzose granite rock, with hornblende and micaceous schist. A shaft has been sunk on this outcrop, vertical for 15ft. or 20ft., and then underlying to the N.E. The baryta in this shaft has copper pyrites and green carbonate disseminated through it to the width of 4ft. or 5ft. in places. Six of the assays returned traces of gold and copper, and one sample gave 6dwts. of gold and 8dwts. of silver to the ton, with 19.4 per cent. of copper. The indications warrant driving on the copper-bearing portions of the lode, and following it down to determine its character more thoroughly.

MOUNT NOR'-WEST.—A copper mine, E.N.E. of Kingston's Well, has been worked by means of some shallow shafts, but the indications are slight. Green carbonate of copper occurs in the joints of a quartzite band, striking N.W. through calcareous and clay slates. (1883.) It was reported in 1896 by Captain Thomas Matthews that malleable copper had been discovered on the property, and that very rich grey and carbonate ore had been found on the surface. The ore carried a very high percentage of copper.

MOUNT PERSEVERANCE (MEGAW'S CLAIMS).—Situating ¼ miles N.N.W. from Olary Railway Station. A large lode of quartz and ironstone traverses this property, dipping to the E., enclosed in micaceous schists. The Inspector of Mines reported a shaft sunk 20ft. on the hanging-wall of the lode, and N. of that several pits excavated. Assayed sample gave neither gold or silver, though it was alleged that silver had been got. From a vein parallel to the main lode copper had been mined, yielding 18 per cent. of copper. Claim worth prospecting for gold. (1899.)

MOUNT REMARKABLE MINE.—Copper ore was found here about the year 1846-7. It was of fair quality, and some samples of it, together with a mineral supposed to be emery, were sent to England. The lode was small and "pinched," and the ground very hard. Nothing worth the name of mining was done, and the claim

was abandoned. The mine is 175 miles distant from Adelaide. (Austin, 1863). This place was visited by the Inspector of Mines in March, 1904, who states that the old workings consist of a tunnel, from 50ft. to 60ft. in length, and a shaft or opening sunk about 20ft.; from these some copper was extracted, but the quantity could not be ascertained. The vein is small, and the enclosing rock hornblende. Two samples taken gave unsatisfactory returns. (I.M.R., 11-3-04.)

MOUNT ROSE MINE.—This is situated about 56 miles N.N.E. from the Blinman, and 2 miles N. of Mount Rose, at the foot of a high spur. One main shaft and several smaller ones have been sunk to a depth of 10 fathoms to 13 fathoms. Apparently the copper ore occurs in two or three short pipe veins running close together or intersecting each other, and dipping, as a body, steeply W. or nearly vertical. The surface outcrops of these veins seem to have consisted of large masses of gossan, more or less thickly impregnated with malachite, and occasionally azurite. Of the ore occurring in depth, a lot left near the main shaft indicates it to be an irregular dense mixture of iron pyrites, copper pyrites, and impure copper glance, but the iron pyrites predominates. A soft micaceous slaty shale appears to form the veinstone in depth. The country in which the veins occur is composed of massive beds of yellowish-grey arenaceous banded slates and slaty sandstones, which alternate with thin bands of dense crystalline limestone and calcareous shale and sandstone. The strike and dip of these rocks is indistinct close to the mine, whilst further off great differences in strike and dip indicate a strong curve, or perhaps some disturbance in the beds. Considering the nature of the ore and the relation of the veins to the country, there is a good chance of the veins continuing in depth. There is, however, one cause for apprehension, namely, that the iron pyrites, which is already very abundant, might still more increase in depth, and thereby cause a serious deterioration in the quality of the ore. (Ulrich, 1872.)

Mr. E. F. Cook, of the E. and A. Copper Company, kindly furnishes the following information from his recollection of the mine :—

No regular lode, I believe, was discovered, although large quantities of grey sulphurets and black oxides were raised, and sent down for smelting at Port Adelaide. This ore was of a very high percentage, the solid being sold at from 45 per cent. to 52 per cent. and the dredgy stuff averaging from 32 per cent. to 35 per cent. The ore was discovered in patches, interspersed throughout with what appeared to be sedimentary ground. Two shafts have been sunk, the deepest being 33 fathoms, and drives have been put out in all directions, extending about 25 fathoms in an E. and W. direction, and about 15 fathoms in a N. and S. direction. The greater part of the ground has been taken away to the 23-fathom level. In sinking between the 23 and 33 level some solid leaders of mundic were cut through, and in a drive from the bottom of the 33 two leaders of the same mineral with traces of black ore were found, and at the end of the drive what appeared to be a solid lode. On picking into this it let down such a quantity of water that the engine was unable to cope with the influx, and the mine was shortly afterwards abandoned. (1886).

In 1898 the ground was taken up and the mine partially unwatered. Work in the lower portions was not, however, attempted on this occasion. Beyond picking over the dump heaps and small desultory operations nothing much was done till the property was taken over by the Northern Mining and Smelting Company in 1903, when a smelter was erected, but mining work has not yet extended below water-level. (24-4-04.)

Up to February, 1906, the total amount of ore from this mine purchased by the E. and A. Copper Company and the Wallaroo and Moonta Company was 548½ tons, containing 165½ tons of copper of the net value of £8,655 18s. 4d. The mine is now in work again, the water has been baled to the 125ft. level and flumed away from the vicinity of the shaft. (March, 1907.)

MOUNT RUGGED, OR PATAWARTA.—Situated 9 miles N.N.E. from the Blinman. This claim contains several lodes, having backs of ironstone protruding above the surface, and showing green carbonate of copper and yellow ore. In addition to good specimens of ore, bismuth of a high percentage has been found here. (Austin, 1863.)

MOUNT STUART MINE.—Situated 18 miles N.N.E. from the Blinman. In a mass of rock running across a gully, containing stains of copper and a good vein of ore, two shafts were sunk near the rocks, one on each side of the gully. There was some ore extracted, and blue and green carbonates, but the general aspects were not favorable for continuance of operations. One of the shafts was sunk to a depth of 10 fathoms. (Austin, 1863.)

MOUNTAIN OF LIGHT.—*Vide* S.A. COPPER CORPORATION, page 129.

MURNINNIE.—This property was held by the Bismuth and Copper Mining and Patent Smelting Company. It was reported in July, 1866, that the mine contained a large quantity of plumbago. The lode in the S. adit was stated to be from 6ft. to 8ft. wide. Situated on the W. shore of Spencer's Gulf, 6 miles inland, 64 miles S. from Port Augusta, and 136 miles N. from Port Lincoln. There are five lodes bearing N. and S., with little underlie. In width they vary from 1ft. to 10ft., and the ores they contain are bismuth, copper, nickel, silver, and cobalt. The percentage of bismuth varies from 18 to 79, copper 10 to 20. The country rocks consist of quartz, ironstone, decomposed slate, and hard slate. Near the adit in the gully there is a little granite. Six shafts have been sunk, one to the depth of 30 fathoms, and two drives have been put in a distance of about 100ft. each. About 1,000 tons of ore have been raised, which is stated to have been worth about £44 per ton in its natural state. The first indications of ore was found in a large block on the surface. The lode was then followed down for 12 fathoms at an angle of 45°, and at that depth a pocket was found containing 60 tons of ore. The winze below the pocket carried a lode 5ft. wide for a distance of 10 fathoms, then came a shoot of about 40 tons. (1890.)

The Inspector of Mines visited the place and reported it was worked in the early days of copper mining; said to contain both bismuth and copper, and for a long period had remained unworked, until about the middle of 1900, when it was purchased by an English company, work being started about three months afterwards. It was found impossible to ascertain the amount of the original output of ore, but during the nine months the new company had been working 15 tons of ore had been sent to the smelters, carrying an average value of 10 per cent. copper, but no bismuth. The principal workings, which are situated in a deep gorge, crossing the line of lode, consist of two tunnels driven N. and S. on the course of the vein, and several shafts or winzes, sunk to various depths, below the tunnel level, the deepest being 175ft. The S. tunnel has been driven about 160ft., and three winzes sunk, disclosing the lode from 2ft. to 5ft. wide, composed of ferruginous matter, containing copper in bunches, of rather low value in bulk. The winzes, as they continue down, prove the formation to be increasing in size, but, at the present level, not improving in value. In the N. winze there is a strong lode, said to contain plumbago, but the character of the material did not appear to be of the best quality. The N. tunnel has been extended a little over 100ft., and here the material is somewhat different, being more of a kaolinised nature, with splashes and nodules of green carbonates, but in bulk of too low a value to be payable. Four winzes have been sunk, ranging in depth from 30ft. to 125ft., the developments showing the same unfavorable character as those previously mentioned; but, the ground being mainly of a soft friable nature, it is quite possible that if the winzes were continued to greater depths more satisfactory results might be obtained. Judging by the present workings, the lode formation is persistent in its course, with fairly well-defined walls, and a regular underlie of about 2 in 6, giving every facility for cheap prospecting below the present levels, by sinking one or more winzes in each tunnel below the present depth, which, in this instance, is the best course to adopt.

Sample taken from tunnel copper, 2½ %; bismuth, nil

“ “ bottom of winze in tunnel “ ¼ %; “ “

(I.M.R., 21-6-01.)

MOSLEY'S COPPER MINE.—Situated about 10 miles N.E. from Moolooloo Station. Work has been chiefly confined to blocks Nos. 2603, 1710, and 908. On 2603 a lode formation from 1ft. to 4ft. wide has been worked by a small shaft to the depth of 40ft.; it is composed of calcareous matter, containing splashes of green carbonate of low grade in bulk, a sample of the ferruginous material giving a return of 1dwt. gold and $\frac{3}{4}$ per cent. copper. On the same block an opening has disclosed a second formation, from 2ft. 6in. to 3ft. wide, and consisting of ferruginous calcite, containing gold and a small percentage of copper; two samples taken the full width of the vein returned, gold 1oz. 9dwts., copper $\frac{1}{2}$ per cent., and gold 1oz. 14dwts., copper $\frac{3}{4}$ per cent. per ton respectively, which is satisfactory and encouraging. About 25ft. E. a small opening has disclosed a similar formation; sample taken gave $5\frac{1}{2}$ per cent. copper and a trace of gold. To the S. the same formation is better defined, and contains green carbonate and bunches of malachite, a sorted sample from one of which assayed $20\frac{1}{2}$ per cent. copper and 2dwts. gold per ton. On block 1710 two shafts about a chain apart have been sunk on a strong formation; in the first, which is down about 10ft., there are a few veins and splashes of copper-bearing material, containing blue and green carbonates and azurite, from which a sample of sorted ore assayed $7\frac{1}{2}$ per cent. copper per ton. The second has been sunk to a depth of 40ft., showing copper-bearing material similar to the first for 10ft.; also bunches of cobalt-bearing material. At the bottom a crosscut has been driven E. about 18ft., without any satisfactory results. A sample of sorted ore taken near the surface yielded $8\frac{1}{2}$ per cent. copper, and a sample previously tried for cobalt returned 12 per cent.; the quantity of the latter ore seems, at present, very limited. Some considerable distance S.W. of this shaft a tunnel has been driven 20ft., on what is apparently the same lode, exposing a large formation, poor in quality, a sample giving only $1\frac{1}{4}$ per cent. copper. On block 908 the principal work consists of the surface being cleared from a copper-bearing material, 40ft. wide, having more the appearance of a mass of country rock impregnated with nodules, seams, and splashes of green carbonates, &c., than a lode; the quality of the ore is of fair value, but the material taken in bulk is of low grade, probably not more than from 1 per cent. to 2 per cent. The inspector states that in his examination of this property he was impressed with the large extent of copper-bearing country, and although the portions at present exposed are of low value in bulk, the indications are, however, such as create the impression that lodes of better value will eventually be discovered. With regard to the gold formation, as so little work has been done at present, it is impossible to give much idea as to its extent or value, but, from its general appearance and the satisfactory results of the samples tested, further development is very desirable. (I.M.R., 27-3-01.)

MUTOOROO COPPER MINE.—Situated about 14 miles S.W. of Cockburn Railway Station. The Inspector of Mines (Mr. Rosewarne) says the ore appears to be making in lenticular deposits, some being of great extent. Large masses of intrusive rocks are frequent, the point of contact being marked by ore of high grade. The surface over three lodes has been opened, and oxidised copper ores of nearly every description are found, including atacamite, azurite, malachite, chrysacolla, and cuprite. In depth the ores change to chalcopryrite, erubescite, and chalcocite. At a depth of 140ft. in Hamlyn's shaft yellow ore, intimately associated with iron pyrites, is found. There has been a considerable quantity of work done, and the property has been proved at the W. end $\frac{3}{4}$ of a mile from the N. workings. The quantity of ore in sight and on the surface awaiting concentration is enormous—perhaps not less than 11,000 tons. The ore can be dressed up to 35 to 40 per cent., and with copper at £50 the mine could profitably employ a large number of hands. At a later period (1890) he again examined the property, when a drive had been put in at the 200ft. level, where the indications led to the expression of his opinion that with further driving and sinking a higher grade ore would be met with. The lode was settled and size unknown, but a width of 7ft. was exposed and no hanging-wall in sight. The stopes in the upper levels in the N. end were looking exceedingly

rich, and in one place would yield 15 tons of 40 per cent. ore per fathom. The low-grade ore would average throughout 12 per cent., but at present no ore under 30 per cent. is sent away from the mine. There is an extensive mineral belt in the locality, and one that will permit of permanent mining.

Captain Tregoweth, the mine manager, furnished the following particulars in 1890:—

The area held is a mineral lease of 320 acres, and so far as developed there are three lodes; strike N.N.E., with underlie generally 75° W.N.W.; width 3ft. to 20ft. Deepest shafts 227ft., 210ft., 200ft., and several others; three vertical and three following the dip of the lode. Drives N. and S. on course of lodes, 850ft.; crosscuts E. and W., 330ft. Matrix of ore, black and brown oxide of iron, decomposed diorite and talcose rock, with iron pyrites; country, clay-slate and micaceous sandstone, with intrusive dykes of diorite; and the ores consist of various rich oxides, grey ore, green and other carbonates, and native copper; output 60 tons per month. The directors have not made a call upon the shareholders since the formation of the company, but have paid over £12,000 in dividends, and, though hindered by the low price of copper recently, have done a great deal of exploratory work, and are now doing more than paying working expenses.

During the last three and a half years 2,517 tons of ore has been extracted, averaging 6.58 per cent. (1899.)

The mine was worked for a considerable time on tribute; but recently systematic mining operations have been resumed.

A departmental report, July 9th, 1907, states:—The only work in progress on this mine for some time past has been that done by tributers, and has mainly consisted of the removal of easily accessible carbonate ores; but about six months ago the Mutooroo Copper Corporation was formed and active developmental operations started. The size and value of the ore bodies at the N. end were demonstrated by the previous company, and the old air shaft, which is 230ft. deep, is now being cut down to make into a main shaft. At the time of my visit 170ft. of this work had been done, and on completion to 230ft. it is proposed to open out along the lode, the value of which is averaged at 3 per cent. to 5 per cent. copper and about 37 per cent. sulphur. The water in this shaft contains 575grs. of copper per gallon; and, by means of scrap iron in wooden launders and cement pits, a precipitation process is in operation, which promises to furnish a good supply of copper.

S. from these workings the lode appears to be thrust to W. by a low hill of diorite; but again, in the S. portion of the property, at least $\frac{1}{2}$ a mile from the main shaft, prospecting shafts have proved its continuity in the same line of strike, viz., N. 20° E. and dip to the N.W. 75°, and its persistence in depth. Three shafts, about 300ft. apart, are in progress: in No. 1 the sulphide lode is reached at 108ft., and is being opened out upon; No. 2, the lode is over 20ft. wide at 118ft.; it consists of pyrites, copper pyrites, and quartz, and a sample taken by me assayed 3.2 per cent. copper and 39 per cent. sulphur; No. 3 is down 80ft., and is being continued on to the lode.

These successful operations in the S. part of the property have greatly enhanced the value of the company's holding, as practically the existence of a new mine $\frac{1}{2}$ a mile away from the original mine has been determined. Tributers in their search for carbonates and oxides discovered this place, and they took out large quantities of carbonate ore; but much remains, in addition to the large sulphide lode, the presence of which in the deeper ground has been proved by the company's shafts. There appear to be two lodes here about 80ft. apart, and the shafts referred to have been sunk on the W. one. (D.R. (Gee), 2-7-07.)

MUTOOROO WEST.—Situated about 2 miles N.W. from the Mutooroo Mine. The main shaft is 170ft. deep—60ft. vertical, and the remainder on the underlie of the lode, which is a very large body of sulphide ore, striking N.W. and dipping steeply S.W. At 110ft. a crosscut 25ft. W. shows the lode to be 20ft. wide, and from this level 110 tons of ore have been stoped and marketed, stated to contain 3 per cent. to 4 per cent. copper and 20 per cent. to 30 per cent. sulphur. At 160ft. a crosscut has been made 14ft. W. through solid sulphide ore. No. 2 shaft is situated about 200ft. S. from the main shaft, and has so far been sunk 70ft. on the underlie of the lode, which shows the same characteristics as in the main shaft. (D.R. (Gee), 2-7-07.)

MUTOOROO WEST EXTENDED.—This adjoins the W. Mutooroo to the S., and a prospecting shaft has been started to cut the lode. (D.R. (Gee), 2-7-07.)

MUTOOROO CONSOLS.—Adjoining to the W. and S. of the Mutooroo. Near the S. boundary of the Mutooroo a shaft has been sunk 103ft. through schist and diorite, and at 60ft. a crosscut made to the N.E. About 120yds. S. of this shaft another one has been put down 45ft., and a crosscut 63° E. About 200yds. W. of S. of No. 2 a third shaft is 80ft. deep—60ft. through schist and the remainder through diorite and formation; at 72ft. a small vein of good green carbonate ore was struck, and is now being driven on. (D.R. (Gee), 2-7-07.)

MUNJIBBIE (now known as the "Wheal Isset").—Situated on sections Nos. 12 and 13, hundred of Terowie. Here the lode strikes N. 16° W., and underlies at an angle of 65° to the W.; it cuts across the strike of the country rocks at an angle of about 46°, and the outcrop can be traced on the surface, with occasional breaks, for over $\frac{1}{2}$ a mile. It has been opened upon by costeans and shallow pits for about 8 chains, is 4ft. to 8ft. in thickness, and consists of quartz, with calcspar, spathic iron, and iron oxides, carrying seams of ferruginous copper ore, copper glance, and carbonates, and is in two veins—one on the footwall and the other on the hanging-wall, separated by a "horse" of country from 1ft. to 4ft. in thickness, composed of fractured clay-slate, limestone, and soft argillaceous mullock. The footwall vein has only been cut through in one place; it shows 3ft. thickness of quartz, &c., carrying small but frequent patches of ferruginous copper ore, with copper carbonates throughout. On the hanging-wall vein a shaft has been sunk 50ft. on the underlie. At 32ft. a level has been put in 33ft. S. along the vein, the good portion of which ranges from 6in. to 18in., and at the bottom a drive 20ft. N., the rich portion of the vein averaging 1ft. No attempt has been made to crosscut and prove the footwall lode, and this should be done from the 50ft. level. About 30 tons of ore have been sent away, ranging from 10.6 per cent. to 21.9 per cent. (George, 17-7-01.)

Locality about 9 miles S.E. of Terowie. The holding consists of two 40-acre blocks, which have been prospected for a considerable length by numerous surface openings and shafts, ranging from 15ft. to 117ft. in depth. The N. block has been worked by cross-trenches, trial pits, and one shaft sunk to the depth of 57ft. The lode formation is apparently from 2ft. to 3ft. wide, consisting of clayslate and dolomite, copper stained, and up to the present of little or no value. Improvement may be found by further sinking, but there is little indication, and further surface prospecting is advised, with the object of locating payable ore bodies, should they exist, prior to incurring the expense of shaft sinking.

The S. block has been prospected on the surface for about 100yds. in length, in each instance exposing lode material. At one point, near the centre of the block, a considerable amount of work has been done, and apparently a fair quantity of copper extracted from an open cutting and two inclined shafts sunk to the depth of 105ft. and 117ft. respectively, the two latter being at the same level at the bottom. There are several drives at different levels, each disclosing lode matter from 3ft. to 5ft. wide, consisting chiefly of clayslate containing an ore vein of a very bunchy character, ranging from 2in. to 18in. wide, composed of green and blue carbonates, also grey ore of good value. The enclosing walls are regular and well-defined, giving every indication of continuing in depth; and it is advised that the shaft, which is 117ft. from the surface, should be continued for 50ft. or 60ft. The ore vein in the bottom appears to be larger and of better value than it has been for some distance above, which is very encouraging and will warrant further explorations. Previous to sinking, it would be advisable to drive S. at the present level a distance of about 40ft. and connect with the second shaft; all workings would then be thoroughly ventilated and greater facilities given for continuing the proposed development and ore-raising operations. Sample taken from dressed ore returned slightly over 19 per cent. copper. (I.M.R., 21-7-06.)

MULGA HILL.—Situated about 4 miles S.E. from the Queen Bee. A shaft 40ft. deep, open workings, and pits extend for about 3 chains along an irregular copper-stained formation, consisting mainly of micaceous ironstone, felspar, &c., in granitic

(pegmatite) rock. The bottom of the shaft could not be examined; but a sample taken from the deepest part of the open workings assayed 4.6 per cent. copper. (D.R. (Gee), 2-7-07.)

MOULE'S CLAIM (formerly known as "Pfitzner's Claim").—Situated about 60 chains S.S.W. of the Yudnamutana Mine. The lode consists of highly fractured quartzite, containing micaceous iron along joints and in strings and veins, and irregularly occurring veins and bunches of copper glance and carbonates. It strikes about N. 3° E., underlies W. at a high angle, and has a thickness at the shaft of 30ft. It has not yet been cut through, and, except for a piece stoped out S. of the shaft, has not been opened upon. A shaft is sunk 23ft. vertical and then 47ft. on the underlie of 70°, following down on the footwall side of, but under, the lode. At 42ft. from surface a drive has been put in N. 20° E. under the lode, and at the end a crosscut was driven W. 6ft. into the lode, which is here heavily stained with copper carbonate. At the same depth another drive extends S. 17° E. for 28ft. in soft micaceous rock under the lode. The first 37ft. driven was along the footwall of the lode, which contains bunches of grey copper ore and carbonates; the remainder of the distance was through micaceous and argillaceous rock, soft and decomposed and lightly stained with copper. At 62ft. from the surface another drive has been made under the lode, in similar soft rock, for a distance of 31ft. S. 17° W. (25-4-04.)

NACKARA PROPRIETARY COMPANY (formerly known as "Robertson's Mine").—The Government Geologist reports on February 16th, 1899:—The locality of this mine is section 13, hundred of Paratoo, 4 miles from Nackara Railway Station. There is a well-defined lode, striking N. 8° to 10° W. and dipping W. at from 65° to 70°, and traversing argillaceous and calcareous slates and sandstone, which it cuts through at a high angle. The width of formation between walls runs from 2ft. to 4ft. The copper-bearing portion is confined to the hanging-wall, on which it forms a lode varying in thickness from 6in. to 12in.

The workings consist of five shafts and connecting trenches and stopes along the lode for a distance of 400ft. From the shafts the lode has been stoped at intervals along its course to a depth nowhere exceeding 30ft. At several places beneath these workings copper ore (sulphide and carbonate) of fair percentage occurs. Samples taken along the lode where ore was accessible were assayed by the Government Assayer, with the following results:—Sample 1, veinstone, 7½ per cent. copper; sample 2, veinstone, 1dwt. gold per ton; sample 3, veinstone, 17½ per cent. copper; sample 4, veinstone, gold a trace, silver 2ozs. 8dwts., 23½ per cent. copper; sample 5, veinstone, gold a trace, silver 1oz. 12dwts., 26½ per cent. copper; sample 6, veinstone, 19½ per cent. copper; sample 7, veinstone, traces of copper.

This lode, though small, has an appearance of permanency in depth. It is well worth prospecting by winzes or inclined shafts, and by means of these the shoots of ore could be followed down and afterwards stoped. The possibilities are that richer and wider deposits would be found; but this prospecting is necessary before going into a large expenditure for permanent work.

I regard this lode as one on which a few working miners should be able to raise payable ore, at the same time prospecting the mine to deeper levels.

A year later the Inspector of Mines states:—The workings, which are considerable, principally on block 1184, extend about 400ft. in length, and consist of sinking small working shafts and stoping to the depth of from 40ft. to 50ft. The lode formation exposed is a little over 2ft. wide, the copper-bearing vein being from 6in. to 12in. thick, composed of siliceous matter, strongly associated with iron, containing in places bunches and veins of green carbonate, grey ore, and red oxide of very good grade. The ore at present (February, 1900) being stoped from the upper workings yields over 40 per cent., but in other places the copper contents are less, making the ore raised in bulk worth 20 per cent. Towards the N. end of the workings the main shaft has been sunk to a depth of 150ft. on the underlie of the lode, 1½ in 6; at the bottom, drives on the course of the lode have been made for 50ft. and 20ft.; the copper-bearing vein is of the same size as above, but at this point

the copper contents are much less, and, although it contains occasional bunches of high-grade ore, yet in bulk it is not payable. By continuing the drives, probably shoots of better class ore may be met with, but the best form of prospecting development would be to sink the main shaft to water-level, and beyond; this will prove whether the sinking of a main vertical shaft to the W. is warranted. Portions of the ore near the bottom contain a little sulphide, showing that a change in the character of the ore may be soon expected, and a probable increase in its value. The lode from the surface is not large, but has proved consistent, regular, and well-defined, with clean and unbroken walls, giving many indications of being a true fissure vein, and persistent in depth; the enclosing rock is clayslate, soft and easily worked. Recently 13 tons of 17 per cent. ore have been sent away, and 10 tons of 20 per cent. are ready for transit. (I.M.R., 12-2-00.)

Again reporting, in September, 1900, the inspector states that the main shaft had then been sunk to a depth of 220ft., a little below water-level. The lode maintains about the same size as in the upper workings, from 1ft. to 2ft., and contains patches and small shoots of fair-grade copper ore, but taken in bulk is rather poor. At the bottom of the shaft 33ft. of drives have been made. Five tons of ore from the 170ft. level were treated at the Petersburg Government works, and gave a yield of 5dwt. 8grs. of gold per ton. The lode material at the bottom is chiefly iron-stained quartz, containing a little copper, and traces of gold. Two drives were then in progress at the 90ft. level; at the N. end the lode is small and poor, and on the S. side the vein is about 15in. thick, 4in. on the footwall side being of fair class ore. Although small, the general features and indications of the lode point to continuance in length and permanence in depth. At the bottom the lode matter is very siliceous, and not favorable for large copper deposits, but appears more promising for gold, as shown by the parcel treated from the 170ft. level. Samples taken gave small returns of gold and copper. (I.M.R., 7-9-00.)

NALYAPPA (WILKAWAT).—Situate a little S. of Moonta Mine. This mining adventure was undertaken early in the history of mining on Yorke Peninsula, in the hope that the Moonta and Hamley lodes might be met with outside the S.W. boundaries of these properties. A great deal of money was spent, and though some of the anticipations formed were realised, the result did not induce the adventurers to continue their outlay.

NAPOLEON MINE.—Situated in the neighborhood of Mount Craig, 79 miles from Port Augusta. About 15 tons of ore were taken from this mine, but it has not been worked of late years. The veinstone consists of carbonate of limestone and feldspar containing a few specks of ore. (1867.)

NEATE'S COPPER MINE.—The Inspector of Mines reports as follows:—This mine is situated $3\frac{1}{2}$ miles N.E. from Caltowie, on an outcrop of metamorphic rock. Green carbonates can be traced along the surface for a considerable distance, and on this line several costeaning pits have been sunk. At the E. end of the claim there is some ironstone, which may be the back of a lode, and at the N. end in each pit there is a fine show of carbonate of copper. Samples assayed $26\frac{1}{2}$ per cent. and 18 per cent. respectively. The lodes, which are in soft ground, might be developed very cheaply, and are worth testing. (1890.)

NEPOWIE MINE.—Situate in the neighborhood of Woollana. It has a copper lode 18in. wide, containing green carbonates, red oxides, and grey ore. (Austin, 1863.) Very little work done.

NEVADA COPPER WORKINGS.—Locality, 2 miles E. from Walter's Well, and about 12 miles E.N.E. of Mount Lyndhurst Station. The Government Geologist reported an examination in the latter part of 1896:—No. 1, an underlie shaft 50ft. or 60ft. deep, angle 35° to 40° S., sunk on a formation partly lode and partly bedded, consisting of carbonate and oxide of iron, calcspar, and copper ores. Commencing with a width of ore 1in. to 2in., the formation increases as followed down to 2ft. or 3ft., where it consists of copper pyrites, carbonate, copper glance, and iron oxide.

Merely prospecting work done up to that date; probably more bunches of ore to be met with in following down the lode formation. Strike, W.S.W.; dip, 35° to 40°; country rock, calcareous clayslate and limestone. No. 2 workings, situate $\frac{1}{2}$ a mile E., consisted of an open cut in gossan ironstone, hematite, &c.; formation 3ft. thick at bottom, and probably would yield copper ore at a greater depth. A few colors of gold visible in the gossan and ironstone. In this neighborhood lumps of rich copper ore are found in the loamy surface soil, indicating the presence of a copper lode, probably of value. Three samples of gossan and ironstone returned gold, respectively 1oz. 15dwts., 7dwts. 14grs., and 7dwts. per ton.

NEW BURRA BURRA (formerly "Warrawilka").—Situated 12 miles E. of Hawker. A large quantity of copper has been sent away from the old workings. Shafts have been sunk promiscuously in the highly-mineralised ground. These lodes are composed principally of calcspar, in which are shoots of carbonate of copper, which have been followed and picked out, so that it is (says the Inspector of Mines) only in one or two places that there is any copper at all in sight. The ore is of fair quality. Nos. 1, 2, and 3 shafts are all about 50ft. deep, whilst others appear to be deeper. There are three tunnels. The ground is easily worked, and likely to contain cupriferous deposits. Properly worked, and a greater depth reached, the mine should be remunerative. (1889.)

NEW YEAR.—Situated 4 miles W. of Beltana. Several prospecting pits have been sunk in soft decomposed slate material, in most instances disclosing green carbonates. In one opening a lode formation, 4ft. wide, showing copper splashes freely, has been exposed. About 2 chains S. of this a shaft has been sunk 40ft., showing small veins and pockets of ore to the bottom; this should be sunk another 20ft., to intersect the main lode, then crosscut W., to test it and the various other formations running through the property. A sample of ore from the shaft gave 7 per cent. This is a fair prospecting venture, and should be further developed. (I.M.R., 7-12-99.)

NEW YEAR'S GIFT.—Situated 4 miles from Tumby Bay. Originally worked by open cutting and a shaft 90ft. deep. Operations in progress, September, 1899, consisted of repairing shaft at 60ft. level, previous to restarting work at the bottom. The shaft is sunk on the lode, which at the surface is 2ft. wide; it contracts, but opens out again at the 60ft. level, where it shows good green carbonates, grey ore, and red oxide, and it was stated to be larger at the bottom. Two tons have been sent away, yielding $15\frac{1}{2}$ per cent. of fine copper. Sample taken from a small vein at 60ft. assayed $23\frac{1}{4}$ per cent. (I.M.R., 14-9-99.)

NILDOTTIE MINE.—Situated 23 miles E. from Blinman. On this property the lode is not well defined. There is, however, a lode of galena which looks promising. (Austin, 1863.)

NILPENA COPPER MINE.—Situation, near Parachilna Gap, Flinders Range, about 10 miles from the railway station. There are four lodes, of which only two are worked; width, 10ft., and widening as depth is reached. Two shafts have been sunk to a depth of 60ft., following the dip of the lode. An adit 130ft. and a level 30ft. have been driven. Ore, carbonate and grey and black oxide; assay, $26\frac{1}{4}$ per cent.; containing rock, clayslate. The lodes crop up at the tops of high hills. The Inspector of Mines reported that from the latter, when he visited the mine in February, 1890, 62 per cent. ore was being raised. The lode in the bottom is widening out, and will probably make a good-sized shoot of ore. The mine should prove payable as development advances.

About 10 years later Inspector Matthews furnished the following report:—

Situated about 12 miles from Parachilna Railway Station. In block 1392 an open cutting has exposed a lode formation 3ft. wide, composed of quartz and iron, showing small splashes of green carbonate of no particular value. On this a shaft has been sunk to a depth of about 130ft., passing through the formation

at 40ft.; from this driving and stoping have been done, but information concerning the quantity and quality of the ore extracted was not available. The material then exposed was of very low grade. On the slope of the hill, in block 1393, about 200ft. above the level of the creek, an open cut, 30ft. long and 12ft. deep, has disclosed a formation of quartz, calcite, and iron, from 5ft. to 12ft. wide, with small splashes of copper on the hanging-wall, and from the bottom of the open cut a shaft has been sunk about 30ft. The bottom could not be examined, but, so far as could be seen, the lode matter is of the same character as the open cut. Some 100ft. below this a tunnel has been driven into the hill nearly 200ft., with the object of connecting with the shaft when sunk deep enough; if this were continued a short distance further it would test the lode value at the deeper level. Through block No. 1391 the main lode is supposed to run, and in various parts trial pits and open cuts have exposed a strong formation, from 4ft. to 10ft. wide, composed of quartz, calcite, and iron, containing pockets and bunches of green carbonate, of low grade in bulk. It was stated that from one of the open cuttings several tons of fair-grade ore had been extracted, but on the pocket being exhausted work was discontinued, without further prospecting. Block 2427 is known as the "Ladder Claim," and is situated about $1\frac{1}{2}$ miles distant. The workings consist of a short tunnel or drive into the side of a cliff, standing about 400ft. above the creek level; it is started on a ledge of rock, about midway up, and discloses an almost horizontal formation, 15ft. thick, consisting chiefly of iron gossan and quartz, with a strong capping of country rock on the top. At the entrance a bunch of copper was obtained, green carbonates being still exposed in places, but as the drive continued the copper contents became less, until, in the present face, none can be seen. It is evident from the various workings on this property that from time to time a fair quantity of copper has been obtained, the better class ore occurring in bunches and pockets; and for some time past the work done has been solely with the object of extracting all payable ore, regardless of any development or search for fresh deposits, consequently the workings are left with a very unfavorable appearance. Sample of sorted ore taken from the dump, probably the last raised from the 30ft. shaft, block 1393, assayed 5 per cent.; from entrance of tunnel, Ladder claim, 4 per cent. (I.M.R., 16-7-00.)

NITSCHKE MINE (also known as "Walton Hill Mine").—Situated 5 miles E. of Freeling Railway Station, in the hundred of Nuriootpa. It was opened more than 30 years ago, and worked for a time, and subsequently about the year 1869. There are numerous shafts, one of which is 200ft. deep. The veins have a strike N. 10° E. The veinstone associated with the ore is calcareous spar; the rocks are crystalline limestone, white marble, and talcose schist. (1886.) On three distinct lines of lode a number of small shafts have been sunk; they range in depth from a few feet to 200ft. The workings on the E. lode disclose a strong quartz and ironstone formation, appearing more of a favorable character for gold than copper, and the former metal should be prospected for. The shaft was down 70ft., with a crosscut W. for 60ft. On the centre lode there are three shafts and several small openings; the depth of the former could not be ascertained, but was estimated from 60ft. to 100ft. In one of the openings, at a few feet from the surface, there is exposed a siliceous vein, 18in. thick, showing stains of green carbonates. On the W., and principal, formation a considerable amount of work has been done. The main shaft was sunk to about 200ft., and it was stated that a drive had been made S. for 150ft. There are two lode formations, 50ft. apart, ranging in size from 2ft. to 3ft.; the matrix is calcareous spar, soft, and inexpensive to work, and of a favorable character for copper-bearing; the enclosing rock is crystalline limestone. The ore is chiefly yellow, portions being coated with black oxide; it occurs in shoots, and gives an average of 25 per cent. At the shallow depths it was principally blue and green carbonate. Other work has been done, such as stoping from the 180ft. level to the surface, proving the main shoot of ore to be 120ft. long, and from which a large quantity

of ore has been extracted. Judging from present appearance and past records, the inspector considered the property worthy of further development, and for this purpose recommended that a shaft should be sunk E. of the present workings, to intersect the lode at 300ft., which would leave fully 100ft. in depth of unworked ground. This would be less costly, and better than repairing the old workings. (I.M.R., 14-11-99.)

NOB COPPER MINE.—Situated about $4\frac{1}{2}$ miles N.N.E. from the Paratoo Railway Station. The Government Geologist reported (1895) that there were here four or five lode outcrops containing copper; strike, N. and S.; dip, about 48° to the W.; country rocks, clayslate and calcareous clayslate. They are true lodes, and five shallow shafts are sunk on the underlie. No. 1 has a vein of gossan and iron ore, with green carbonate of copper, varying in thickness from a few inches to a foot, which has been sunk upon for 10ft. In No. 2 excavation, about 6ft. deep, an argillaceous gossany vein, stained with carbonate of copper, is exposed. No. 3 sinking exhibits a gossany vein, 3in. to 6in. wide, carrying oxide and sulphide of copper of fair percentage. A rough average sample returned 34 per cent. copper, and a trace of gold. No. 4 excavation shows a well-defined vein of gossan and ironstone, with oxide and sulphide of copper, varying in width from 3in. to 10in.; strike, N. and S.; dip, 40° to 45° W.; has been sunk upon 18ft. or 20ft. following the underlie. No. 5 shaft shows a similar vein to that last mentioned, containing a fair percentage of copper. Samples from these shafts returned $52\frac{1}{2}$ per cent. and $40\frac{1}{4}$ per cent. of copper on assay, together with a trace of gold. No. 1 shaft yielded ore returning 2dwts. of gold to the ton. These small veins have every appearance of continuing down and increasing in size. The indications warrant prospectors sinking to water-level and exploring by drives, the probability being that larger deposits of copper ore will be met with.

NORTH-EAST MOONTA MINING COMPANY.—A large company was formed under this name to prospect in the mineralised country midway between Moonta and Kadina, and, in the course of a great deal of costeaning work, the backs of two or three lodes were opened. In one place a shaft was sunk to a depth of 20 fathoms and a drive was put in; but, as the lode did not promise satisfactory results, and the water required pumping machinery, that, and other trial shafts on some of the 20 or 30 sections held, was abandoned.

NORTHERN MONARCH (also known as "Easter's Claim").—Situated in the hundred of Cudlamudla. Four shafts were sunk, and drives were put in, but failed to disclose any courses of ore that would pay to work. The Inspector of Mines' report was that the picked ore bagged on the surface was worth only about 15 per cent. Copper can be traced for a long distance on the surface on a N. and S. course.

NORTH POONA.—Situation, W. of Moonta and Wallaroo tramway, near the Poona Mine. Costeaning revealed the back of a lode, upon which a shaft was sunk 17 fathoms. Black oxide was found, but not in payable quantities. Further sinking exposed a well-defined lode 3ft. wide, in an easy channel of ground. Lack of capital stopped all further operations.

NORTH RHINE MINE.—Situated about 10 miles from Angaston, on sections 563 and 570. Copper is found on the whole of the land, and one of the lodes is traced through two sections. There are two lodes running nearly parallel in a N. and S. direction, with a W. underlie of about 18in. in the fathom. The ores found near the surface were blue and green carbonates. The E. lode was first opened, and about 20 tons of 20 per cent. ore sent to England; but the water soon increased, and an engine-shaft was sunk near the main, or Nicholls', lode, and a 70 horse-power engine fixed. Another shaft was sunk near the engine shaft, and the lode was cut at 20 fathoms, 4ft. wide, and composed of black ore, mundic, and spar. Sinking was continued to the 30-fathom level, where the lode was not found to yield ore in paying quantities. The shaft was then carried on to the 43-fathom level, where a drive was made on the course of the lode for 70 fathoms. The lode here varies from 3ft. to 6ft. in width, but contained too large a proportion of mundic to allow of its

being worked to advantage. The engine shaft was sunk to a depth of 60 fathoms, and another drive made for 50 fathoms, but the lode was not deemed payable, although containing black sulphuret throughout. The mine was opened in 1849-50, and was worked till 1851. From that date to 1859 it lay idle, but was reworked from 1859 to 1862-3. (Austin, 1863.)

NORTH-EAST MATTA.—Situating near the Matta Matta, close by Kadina, sections 223 and 224, hundred of Wallaroo. According to the report of Mr. Mitchell, lately mine manager of the Kurilla Mine, dated June 8th, 1888, two shafts were sunk on this property to the depths respectively of 60ft. and 120ft. In the latter a lode has been driven upon N. 24ft., and in the end it was 2ft. 6in. to 3ft. wide, and contained first-class black oxides and a sulphide of copper mixed with iron pyrites and quartz. He regarded the lode as a "strong and permanent vein."

A departmental report, dated September 30th, 1902, states that no work had been done on the property for 11 years. At the time of inspection a little surface trenching was in progress. (30-9-02.)

NUCCALEENA MINE.—Situating 13 miles N.W. from the Blinman. The open workings indicate that the ore deposit is a true lode. It is in a flat curve, having a mean strike of W. 20° N., and crossing the steep slope of a hill of medium height, traverses the beds of the country. The strike of these is N. 45° W., with a N.E. dip at an angle of about 33°. The underlie of the lode and its thickness near the surface appear to have been very irregular. The rocks near the lode, in depth, consist of hard blackish, thick-bedded, calcareous slate, but at the surface they are yellowish-white, rather soft, and full of veins and small patches of brown iron ore with green copper stains. The examination of the metallic and other minerals, as seen in a large heap of ore, from above the water level, on the dressing floor, gave the following result:—Ochreous gossan, enclosing massive patches and druses of acicular crystals of atacamite, generally associated with some malachite and silicate of copper, patches of tile ore, a few small veins and patches of red oxide of copper, and still fewer specks of native copper. Mammillary brown iron ore and calcite appear frequently in irregular cavities. From below the water-level, massive, coarsely crystalline, spathic iron, full of specks, patches, and seams of copper pyrites, associated with a little iron pyrites, quartz, crystalline, and in veins, occasionally white calcite, imperfectly crystallised, in druse cavities. A piece of dense, white, heavy spar, found near the lower workings, would also indicate the occurrence of this mineral in that portion of the mine.

About 20 chains E., round the base of the hill which the lode traverses, a roomy tunnel—now partially fallen in—has been driven from near the bottom of a gully S. 23° N., i.e., about in the direction of the top of the hill. The strata penetrated consist of alternating white, yellowish, and brownish-red flaggy slates, in part concretionary, and quartz ore, and much stained and veined with brown iron ore. At mouth of tunnel, and for some distance in, they are very friable, full of dentritic markings, and contain scattered cavities, coated with calcite. Judging from a heap of ore left at grass, of fair quality, and composed of the same minerals as those just enumerated from above the water-level of the main workings, this tunnel must have struck the continuation, or perhaps a new make, of the lode—a fact which would indicate that the latter, though of rather short extent on the surface, lengthens considerably in depth. Considering this in connection with the otherwise very favorable character of the lode, more especially as regards quantity of ore and nature of associated minerals, Professor Ulrich was of opinion that the mine had been too hastily given up, and deserves another trial in depth; for the running out of the lode in dip, which, it is said, led to the desertion, is most probably only a local contraction, or may, perhaps, be due to a fault, and the search was conducted in the wrong direction. (Ulrich, 1872.)

An inspection was made in August, 1902, and the following information supplied:—Latterly very little work has been done, except to break out what ore was left exposed in the old workings. Several shafts and drives were sunk and driven, but

recently the timbers have been burnt, and the workings fallen in and mullocked up. One of the old adits had been cleaned out, $6\frac{1}{2}$ tons of low-grade ore had been picked from the dumps and sent away; $3\frac{1}{2}$ tons were on the floors. (27-8-02.)

NEYLON'S CLAIM.—On sec. No. 87, hundred of Uroonda. A vein of calcspar with quartz and micaceous iron, small nodules of copper glance, sulphide, oxichloride, and carbonates strikes S. 8° E. and underlies W. nearly vertically, cutting through almost horizontal alternating beds of limestone, clayslate, and highly micaceous sandstone. A shaft has been sunk 12ft. vertical, and thence on the underlie of the lode to a depth of about 90ft. S. from the shaft an open cut has been made along the vein for a length of about 200ft., being 10ft. in deepest place. In the shaft a drive for 12ft. S. has been made at 50ft. The vein averages 8in., but the copper contents seem small. E. two small shafts have been sunk on similar veins. (George, 24-4-04.)

NELSON AND WILLIAMS' CLAIM.—Situated about 1 mile S.W. from Leslie's Well. A network of small veins, carrying cuprite, malachite, and a little copper glance, contained in soft clayslate and kaolin, which has been worked by numerous shallow pits and costeans covering an area of about $\frac{1}{2}$ an acre of ground. No testing at depth has so far been attempted. (George, 27-8-02.)

O'DONNELL'S CLAIMS.—*Vide* S.A. COPPER CORPORATION, page 130.

O'LOUGHLIN SYNDICATE.—*Vide* S.A. COPPER CORPORATION, page 131.

OLADDIE, HUNDRED OF, SEC. 25.—Situated about 10 miles from Orroroo, in the Bendleby Ranges; favorable for carrying mineral lodes. Describing this venture as seen on a recent visit, the Mine Inspector states that there are several outcrops of lodes crossing each other obliquely, and on the surface can be seen specks of copper distributed through the limestone capping. A tunnel has been driven, apparently on the hanging-wall of a large formation, about 2 per cent. of which is copper. A picked sample selected by the inspector gave $12\frac{1}{2}$ per cent. of copper and 1dwt. of gold per ton. The prospect suggests further development, and the district as a whole is worthy of attention. (1889.)

Davill's No. 1.—Situated about 7 miles N.E. from Walloway Railway Station. Here a large, irregular, ill-defined and almost flat bed or formation consisting of slate, hematite, ferruginous calcite, and barytes shows copper stains and small veins and patches of green carbonate and copper pyrites. A tunnel was driven some time ago from the N. side of the hill along and under the bed, and a shaft sunk at the end. A 5-ton parcel from this place gave only 4 per cent. copper, and a sample taken by me assayed 5 per cent. copper. On the E. side of the hill a tunnel is being driven to intersect a vein from which 12cwts. of 36 per cent. ore was obtained near the surface; and on section 24, adjoining, pits and excavations have been made on small seams of ore. Good patches will doubtless be found here, and are worth prospecting for, but no lode body has yet been met with. (D.R. (Gee), 13-6-07.)

OLADDIE, HUNDRED OF, SEC. 45.—Locality, S. from Colliny Spring. There are N. and S. veins of limestone, spathic iron, quartz, and iron oxide at intervals, showing a little carbonate of copper; rocks, calcareous slates and limestone. No indication of a defined lode or formation. A picked sample gave 8 per cent. copper. It is unlikely that anything more than small pockets of ore will be found. (Government Geologist, February, 1899.)

OLADDIE, HUNDRED OF, SEC. 159.—*Davill's No. 2.*—Situated about $1\frac{1}{2}$ miles S.W. from No. 1. This is in rough country on the E. side of the hills fronting the Oladdie Plain. A well-defined lode strikes N. and S., dips 70° W., and is exposed by a shaft 28ft. deep on the underlie and an excavation near by. It consists of a vein of ferruginous calcite, copper pyrites, and malachite from 6in. to 18in. thick on the hanging-wall, then slate, carrying copper, 1ft., and a vein of 18in. on the footwall similar to that on the hanging-wall, a sample from which, taken by me, assayed 23 per cent. copper. About 6 chains S. another shaft has been sunk, in which the lode appears similar to the first one; a general sample from the spoil heap here assayed 5 per cent. copper. The lode has been traced on the surface for more

than a mile; an outcrop about 4 chains N. of the first shaft shows about 8ft. wide. It is weathered and copper-stained, and a surface sample across it gave 1.3 per cent. copper.

So far only $1\frac{1}{2}$ tons of dressed ore have been marketed, and of this 1 ton realised 28 per cent. and $\frac{1}{2}$ ton 13 per cent. This is a well-defined lode which is very promising, and should be vigorously prospected. (D.R. (Gee), 13-6-07.)

OLD NOLL'S MINE.—This property adjoins the Daly Mine at the S.W. corner of the section. It is on a hill of considerable elevation, and contains a fine deposit of green carbonate and red and grey oxide of copper in a large reef of rocks running for some distance along the top of the range. (Austin, 1863.) The Inspector of Mines reported in 1890 that this venture adjoins the Sir Dominick on the S., and was worked for a short time by a Ballarat company. They raised about 30 tons of copper ore (at the time of his visit still lying on the ground). The quartzite and country are similar to those on the Sir Dominick. The mine is in an almost inaccessible region.

A report of an examination made in August, 1902, says that two men were at work breaking out ore on the summit of the spur. No shafts or drives are required here at present, as a considerable amount of rich copper ore can be obtained from the outcrop forming the back of a high spur. It strikes E. 27° S., and carries irregular veins, strings and bunches of cuprite, chalcocite, malachite, azurite, atacamite, and ferruginous copper ore. During the first five months of 1902 about 5 tons of rich ore were raised and sent to the smelters. (George, 27-8-02.)

ONKAPARINGA COPPER MINE.—This is situated on the Echunga Goldfields. There is no indication of copper at the surface, but a well-defined quartz reef with pyrites strikes N. and S., with a dip of 30° W. It is in sandy micaceous slate of the same dip, and underlies false-bedded micaceous sandstone and grit. This reef was originally prospected for gold. A shaft 30ft. deep was put down alongside the reef, and a tunnel was driven in the side of the hill to within a few feet of the shaft, at about 20ft. from the surface. In connecting the drive with a tunnel the present (1884) holders of the mine struck a mullocky copper lode, which makes and leaves the reef at 18ft. from the surface, running vertically down. The minerals contained in the lode are crystalline quartz, pyrites, chalcopyrite, native copper, chalcocite, malachite, and azurite. Two miles E., on a hill, is a lode formation with a quartz reef containing copper stains and small crystals of atacamite. (Govt. Geologist.)

ORALDANA MINE.—Situated about $5\frac{1}{2}$ miles W. of Woollana Station. The copper ore occurs as an impregnation in a ferruginous quartz-pebble conglomerate. This covers an area of several square chains, and from it rise two craggy, highly silicified, irregular masses of from 8ft. to 12ft. high, and standing about $2\frac{1}{2}$ chains apart. These outcrops, as well as the mass between, show abundant copper stains and coatings in every joint and crevice. They also contain small pockets filled with soft white arenaceous clay, through which little nodular concretions of malachite are scantily distributed. On being broken the softer parts of the rocks show specks and thin seams of grey oxide of copper, whilst the larger malachite nodules often contain this ore in the centre.

The eupriferous outcrop forms part of a very thick deposit of similar, though softer, conglomerate, which alternates in close vicinity with hard micaceous slates—the line of boundary of the two lodes, i.e., their strike N. and S. being clearly indicated on the surface by the rich brown soil of the conglomerate contrasting strongly with the greyish one of the slate. The latter alternates on the top of the opposite range (W.) with bands of hard siliceous limestone, and the top of the range is composed of thick beds of quartzite, the dip of their strata being W. at an angle of about 30° . The ore-bearing conglomerate mass looks, no doubt, very poor, and has therefore only been indifferently prospected by a few shallow excavations; but, considering its highly fractured character and the ease with which it could be quarried into from the steep slope of the hillside, a further trial right into it, and more especially along the boundary of the slate, would not be expensive, and might possibly lead to the discovery of some better pockets of ore. (Ulrich, 1872.)

ORATUNGA MINE.—There is a good lode averaging about 12ft. in width, and containing very fair ore. Shafts have been sunk on the lode, varying in depth from 6 fathoms to 15 fathoms, and ore was obtained in each, nearly 100 tons being raised. At a depth of about 12 or 13 fathoms a peculiar slide seemed to have taken place in the lode, and a floor came in, having a slope of about 25°. This was followed down until the miners were stopped by water. In another place about 20 tons of 30 per cent. ore were raised from a counter of the lode, and a shaft sunk with a view of cutting the lode at 18 fathoms or 20 fathoms, but this was also stopped by water. (Austin, 1863).

This property lies on the S. slope of a low range about 12 miles N.W. from the Blinman Mine. The ore deposit represents a so-called pipe vein, 12ft. to 14ft. in width and from 6ft. to 8ft. thick, with well-defined walls, dipping E. at an angle of about 60°. Brown, much cleaved, flaggy slates alternate with greyish-white argillaceous ores. The strike is N. 5° W., and the dip in that direction is somewhat steeper than the slatebeds, which strike N. 40° E., and show a N.W. dip of 15° to 20°. At the outcrop the ore consists of an ochreous gossan, full of small patches, irregular veins, and fine druses of acicular crystals of malachite. There are occasionally similar druses of aragonite associated with it. In depth the ore changes to coarsely crystalline chalybite (carbonate of iron) full of small patches and seams of copper pyrites, and generally associated with quartz. The stoppage of the mine is said to have been caused by the deposit being faulted in depth by a slide, and that the search for it became too expensive. (Ulrich, 1872.)

Five shafts have been sunk, two vertical and three following the dip of the lode, which contains green malachite and copper pyrites. In the N. portion of the mine the lode is composed of chalybite and spathic iron and copper pyrites. The mine was worked in former years, and it is believed large quantities of copper could yet be obtained from it. (Captain Doble, Blinman, 1890.)

The Inspector of Mines examined this property in March, 1901, and reports that, with the exception of sorting over the old dumps and waste material, it has not been worked for many years. The vein contains, near the surface, green carbonates and small portions of malachite in veins and patches, and, judging from the material on the surface, these have given place to chiefly carbonate of iron, containing bunches and seams of copper pyrites. During the time the mine was worked a fair amount of copper must have been extracted, as several men have been employed in dressing ore from the old dumps. (I.M.R., 25-3-01.)

O'DONOGHUE'S CASTLE.—Situated 7 miles from Balcanoona Head Station, on a steep rugged hill rising about 200ft. above the plain level, giving every facility for working by tunnels. The lode outcrop is a large formation on the top of the hill, strike being about N. and S. At the S. end the outcrop rises several feet above the surface, and at the N. end the surface formation indicates the presence of two lodes some short distance apart, but until further prospected it is impossible to determine that point. Almost all the workings are confined to block No. 255, and consist of surface openings, two tunnels and drives for a short distance on the course of the lode. The S. workings, in the form of an open cut, situated near the hill top, show the lode formation 21ft. wide, with 10ft. of intrusive rock in the centre, the best copper-bearing portion being on the W. side. The E. portion also contains copper, but of slightly less value. As the workings continue N. the intrusive rock will probably disappear, leaving the formation slightly smaller, but more solid and compact. Continuing N., little or nothing has been done beyond some small cross trenches, proving the lode to be continuous for a considerable distance. No. 1 tunnel, which is toward the N. end, has been driven 80ft., and the lode on the E. portion intersected, proving the formation to be 5ft. wide, with 2ft. of copper-bearing material on the footwall, and at the time of inspection was looking very well indeed, the ore being blue and green carbonates, with azurite of very good grade. No. 2 tunnel is driven at about the centre of the hill, a distance of 232ft., being a vertical depth of 130ft., but considerably more

on the lode underlie. At this point the lode is from 2ft. to 4ft. wide, containing, on the footwall side, from 18in. to 2ft. of fair-grade material, composed of green carbonates, grey ore, and sulphides, occurring in bunches, strongly associated with iron. From the tunnel a drive, about 6ft., shows the same class of ore vein. A drive has also been made S. 55ft.; in the face the lode has contracted, but the hanging wall is clean and well defined. Probably, if the drive were continued some short distance further, the lode would again open out to its usual size, surface indications pointing to that conclusion. As the tunnel is driven in a portion of the hill which is disturbed and broken on the surface, the same break will probably continue in the lode to a considerable depth below the tunnel level, the ore vein making larger both N. and S. from this point. To further prospect and develop this property, it would be advisable to extend the S. drive a further distance of about 80ft., when it would then be underneath the large outcrop exposed in the open cut on the surface, and from which a quantity of fair-grade ore has been dispatched to the smelters; also continue the N. drive, and sink winzes to prove the lode to a deeper level, at the most favorable points. The manager stated that recently there had been raised and sold to the E. & A. Copper Company a little over 66 tons of ore, yielding an average value of £5 14s. per ton. No allowance was made for gold, silver, or cobalt; 30 tons carried a little over 2 per cent. of the latter, and the average ore contains from 2oz. to 8oz. of silver, and from 1dwt. to 2dwts. of gold per ton. Samples were taken, and gave the following copper results:—

Copper.

Bulk sample, open cut.....	15½ per cent.
“ “	15 “
No. 1 tunnel, dressed ore.....	21 “
No. 2 tunnel (first), dressed ore.....	27½ “
“ (second), dressed ore	21½ “
“ (third), not dressed.....	17½ “

These may be considered very satisfactory, and fully warrant expenditure in further development of the property. (I.M.R., 28-6-00.)

The low price of copper and the cost of cartage made it impossible to carry on operations at a profit; a departmental report dated August 27th, 1902, states that the mine was then practically abandoned. It has recently been again taken up. (1907.)

O.K. COPPER MINE.—Situated at the N. end of Lake Torrens, and about 2½ miles E. from Yarra-wurta Hill. Workings consist of two shafts, about 25ft. deep each, and various shallow pits and costeans. No defined lode. Small irregular joints in the country rock, containing argillaceous matter, iron gossan, rock fragments, and bunches of copper glance, ferruginous copper ore, and copper carbonates. About 40 tons of 54 per cent. ore have been disposed of. (George, 21-1-04.)

PARABARANA MINE.—Situated at Parabarana Creek, 84 miles E. of Farina, and about 2 miles S.E. of Parabarana Hill. It has three distinct lodes, two running N. and S. and one E. and W., and in all of them blue and green carbonates have been found. This mine has been worked recently, and a shaft is down to about 200ft. It is now stated that there are seven distinct lodes, and that a large quantity of ore fit for concentration is accessible. It is alleged also that gold to a high assay has been found in the ores. Mr. Cullingworth (1899) states that the copper value of the ore is from 10 per cent. to 12 per cent., and that a good body of ore is in a 3ft. lode at bottom of the deepest shaft, carrying on an average 8 per cent. to 10 per cent. for copper.

Inspector Matthews reports:—The principal workings are on the E. side of the range, in block 349. The lode outcrops strongly, and in one part is fully 30ft. wide, containing bunches and veins of green carbonate and grey ore; here the work done has consisted simply in breaking down the outcrop and making

an open cutting, from 6ft. to 8ft. deep, and from this a considerable quantity of high-grade ore has been obtained. About $\frac{1}{2}$ a mile S. of the large outcrop there are several small openings on the line of lode, and one shaft sunk to a depth of 200ft. on the lode underlie. At a depth of 30ft. a fair quantity of high-grade ore was obtained, but apparently at this point the rich copper disappeared, and gave place to iron gossan of low value. The width here has not been determined, but it is evidently large, and for the first 30ft. below the 150ft. level the lode contracted to about 12in. Underneath, and to the bottom, the formation has opened out to 4ft. thick, containing bunches and splashes of good-looking green carbonate, seeming to improve in depth. N. of the outcrop there is a large mass of decomposed copper-stained material, known as the Green Hill, which, although not in a direct line, is doubtless the same formation as that exposed in the other workings. This has been opened out upon in places by trial pits, which show copper stains throughout, with here and there small specks of grey ore, not at present of high enough grade to be valuable, but still sufficient to warrant further prospecting by driving a tunnel through the formation from an open cutting at the foot of the hill. On the opposite side a vertical shaft has been sunk 70ft. or 80ft., apparently in country rock. The property is extensive, and has been prospected in various other places. Concentrating machinery was in course of erection at the time of the inspector's visit. Samples taken from the workings where ore was being raised for treatment assayed $9\frac{1}{2}$ per cent. and $10\frac{1}{2}$ per cent. (I.M.R., 6-7-00.)

In August, 1902, it was reported that no developmental work was in progress. Six tributaries were engaged in stoping out ore from the old workings. Lee's underlie shaft was sunk 210ft.; at 200ft. a drive has been put in along the lode for 25ft. S.W., and the lode had recently been stoped out for that length and a height of 10ft. This shaft was sunk in the country rock below the footwall, and only touched the lode in two places above the 200ft. level. The veinstone consists of siliceous ironstone, gossan, and a little quartz, with copper glance, ferruginous copper ore, tile ore, and copper carbonates; it varies in thickness at the 200ft. level from 1ft. to 3ft. Strike S. 65° W. and underlies N.W. at about 25° . About 4 chains S.W. from Lee's shaft a drive has been put in about 40ft.; at the start of this an outcrop of siliceous ironstone, with calcite, cuprite, malachite, ferruginous copper ore and iron oxides, of considerable thickness, was cut through; beyond this the drive was all in country rock. N.E. from Lee's shaft and close alongside it three other shafts were sunk, one vertical 80ft. deep, and two inclined—40ft. and 30ft. About 20 chains N.W. from Lee's shaft two inclined shafts have been sunk 12ft. apart to the depths of 30ft. and 60ft.; in the bottom of the 30ft. shaft a small bunch of copper glance is showing. The 60ft. shaft, from surface down to 40ft., is about 12ft. wide, where a bunch of ore has been stoped out. Small pockets of copper carbonates, associated with kaolin and cupriferous gossan, are still visible, although no defined lode exists in these shafts. About 25 chains N.E. from Lee's shaft an outcrop of ferruginous calcite occurs, which carries small splashes and strings of copper glance and cuprite; it has been opened upon to a limited extent by quarrying, and several tons of veinstone from it have been treated at the concentrating plant. At the Green Hill a tunnel has been driven 50ft. from the approach and at the face a small seam of copper carbonates is exposed. The outcrop here consists of quartz and argillaceous material of considerable thickness and stained more or less heavily with green carbonate. It strikes N. 80° E. and underlies N. at a very low angle. At Windy Creek a shaft 50ft. deep, and several smaller shafts, pits, and costeans have been sunk to shallow depths on quartz lodes carrying copper glance and carbonates in small quantity, and also on copper-stained heads and joints in the country rock.

Near Parabarana Spring a small crushing and concentrating plant was roughly erected and a few tons of ore treated, when the company ceased operations. About 20 tons of high-grade ore was raised between January 1st and May 30th, 1902 (Departmental report (George), 27-8-02).

The mine was abandoned by the company and the machinery removed. The ground is now again held, and returns from the claimholder show that from June 1st, 1905, to December 31st, 1906, 66 tons 7cwts. of ore, worth £1,128, had been marketed.

PARAMATTA MINE.—This mine, situated a little N. of Moonta, was worked for many years, with a fair yield; but the country became so hard and working so difficult and expensive, as compared with results obtained, that operations were suspended, and the mine has not been worked now for some years. The deepest shaft was 500ft. This mine, together with the Wheal Hughes and Wheal James, has been acquired by a company, and will be worked as one property. (1899.)

In February, 1901, the Inspector of Mines (Mr. W. H. Matthews) reports that the new company had restarted operations some 12 or 18 months before. The main work of the old company consisted of four shafts, from 252ft. to 432ft. deep, with drives, stopes, and winzes, from which a considerable quantity of copper ore had been extracted. The ore-bearing ground proved to be about 400ft. in length, and the average width of lode about 6ft. Since the new company has resumed work, machinery, consisting of winding and pumping engines, air compressors, concentrating plant, &c., have been erected. Underground work consists of sinking the main shaft from 432ft. to 522ft., and N. and S. drives, about 30ft. each; the lode averages about 6ft. wide, is well defined, with every appearance of continuity in depth. At the deepest point (bottom of the shaft) the copper contents are about 3 per cent. Face of the N. drive shows considerable quantity of iron pyrites, making the ore poor, but, from indications, better class ore will be shortly encountered. The S. drive exposes about 4 per cent. ore throughout. Two winzes have been sunk on the course of the lode, N. and S. of the main shaft, at the 432ft. level, N. winze down 54ft., lower portion in poor ore; S. winze, 90ft. level, with S. bottom drive through fair quality ore. Stoping has been in progress, and a considerable quantity of fair-grade material is available in the upper workings. The inspector recommends that the winzes should be connected with the drives at the 522ft. level; that the main shaft should be continued for another 100ft.; drives made at that level, and connected by winzes with the workings at 522ft. level; and that the ore from the upper levels should only be treated in conjunction with that from the new workings. (I.M.R., 1-2-01.)

In April, 1902, the inspector reports vigorous operations in progress generally, and that the main shaft has been carried down to a depth of 606ft.—84ft. below the 522ft. level—the development in the last 48ft. being of an important nature, the lode at the bottom showing fully 9ft. wide, and being worth from 10 per cent. to 13 per cent. The inspector emphasises the necessity of continuing the sinking of this shaft for at least another 100ft., and carrying out his previous recommendations. (I.M.R., 4-4-02.) During the year 1903, 20,646 tons of average 4 per cent. ore were raised from this mine; it is now being worked in conjunction with the Yelta, where a blast matting furnace and other machinery have been erected.

Returns show that from January 1st, 1904, to June 30th, 1907, 2,770 tons of copper have been produced. The depth of the deepest shaft is 1,239ft., and 400 men were employed.

PARARA MINE.—This was a working near Ardrossan, on Yorke Peninsula, where the surface indications were very promising. After sinking a shaft and driving for some time the adventurers ceased working, the available capital having been exhausted. (1899 edition.)

In July, 1906, the Inspector of Mines reports:—This property is situated on a small rise about 2 miles N.W. of Ardrossan. It was worked in the early days, and it is stated that a fair quantity of high-grade ore was extracted; but at that time, the value of copper being low and the transit charges high, all operations were discontinued and, so far as could be ascertained, the mine has been unworked until recently, when a small syndicate took possession. As the original workings were

full of water they could not be examined, but from the last report of the manager (T. Tregoweth), dated September 23rd, 1874, it appears that the main shaft has been sunk to the depth of 180ft., and drives opened out at the bottom and 120ft. levels. A winze was sunk from the latter to the former and crosscuts driven disclosing solid lode 20ft. wide, consisting of calcareous spar, quartz, schorl, and mundic, with veins of rich yellow ore running through it. For the future working he advises the further sinking of the main shaft, and driving to open up the lode at the present level, to stoep the ground N. of the shaft, believed to be payable; and in conclusion says, "I can truly say that the lodes at the deepest level are quite calculated to establish the opinion I have before expressed that the 40-fathom level will open up rich lodes of yellow ore. I may add that this is the opinion of every practical man who has seen them."

Recent operations have been confined chiefly to the sinking of an inclined shaft to the depth of 80ft., continuing in the lode the full depth; this has exposed lode formation apparently from 8ft. to 10ft. wide, striking slightly E. of N., consisting principally of quartz strongly associated with iron and a little manganese, containing throughout streaks and bunches of grey ore and green carbonates, with smaller portions of molybdenite, having, generally, a very favorable appearance. Six tons of this ore have been dispatched to the smelters by the present owners, and returned slightly over 31 per cent. copper and 8dwts. gold per ton, and at present in the ore dumps there are from 8 to 10 tons waiting treatment; samples from the firsts returned 46 per cent. and 1dwt. gold per ton, and a small parcel of seconds yielded 23 per cent. copper and 7dwts. gold per ton. W. of the lode there are indications of other parallel formations, so far only opened up by small shallow cross trenches, which could be cheaply tested.

To further develop and prospect this property it would at first be advisable to confine all operations to opening up the main shaft, by timbering the portions required, erecting a horse whim or whip, and unwatering the deeper levels; which, so far as could be ascertained, can be done with the appliances suggested. The lode is of a favorable character, containing the various classes of ore that usually continue in depth, and, judging from the old records, will fully warrant the expenditure required to test its value. (I.M.R., 2-7-06.)

A further report in April, 1907, states that the principal work done since the previous report consists in sinking a main shaft to the depth of 120ft. and connecting it with the old workings from the original shaft a short distance to the N. So far as the drives and stopes at this point could be examined the lode appears to be from 15ft. to 20ft. wide, principally of quartz strongly associated with iron and containing bunches and streaks of high-grade material—chiefly carbonates and grey ore, associated with smaller portions of azurite and malachite. These ore bunches do not appear to be confined to any particular part of the lode, but occur in the most erratic manner, making it necessary to extract the full width of the lode and sort the higher grade from the lower. Towards the S. end of the drive or workings a crosscut has been made, exposing the formation 20ft. wide. The lode at this point is of rather low value; the main ore shoot apparently dipping S., has passed beneath the workings, but would be again intersected in the drive underneath. W. of the main lode, which strikes slightly E. of N., there are indications of other parallel formations which have so far received no trial beyond being opened up by a few small cross trenches, and can be further prospected at a very small expense. Recently 17 tons of the average value of 26 per cent. have been marketed. A further parcel on the dressing floor, waiting transit, assayed, firsts, 32.5 per cent., seconds, 15.7 per cent. On my previous visit I suggested timbering up and unwatering the old main shaft; but as the holders thought this work beyond their means and have sunk a new shaft, I would suggest that the sinking of the latter be continued. The lode is of a favorable character, containing the various classes of ore that usually continue in depth, and, judging from the old mine records, will fully warrant the expenditure required to prove its value. (I.M.R., 29-4-07.)

PARATOO COPPER MINE.—On section 135, hundred of Paratoo, $2\frac{1}{2}$ miles from Paratoo Railway Siding. This mine is described by the Inspector of Mines as situated in a locality favorable for cupriferous lodes. Small outcrops of manganic iron run E. and W., showing copper. Picked pieces of copper ore from this outcrop assay as much as 62 per cent. metallic copper. Two shafts sunk 70ft. are connected by a drive. The bunches of ore are very irregular, but the sinking has not yet reached settled country, so the value of the mineral deposit has never been ascertained. The sinking is easy. (1889.)

PORT LINCOLN MINE.—Situated 5 miles from Tumbay Bay. A fair quantity of good ore was raised from this mine at different times, but the hardness of the ground was an obstacle to its being profitably worked. (Austin, 1863.) Several shafts were sunk, but the influx of water was very considerable. The property comprises 705 acres, in nine adjoining sections, taken up by a company formed in 1861. Its prospectus stated that 300 tons of ore averaging between 25 per cent. and 30 per cent. had been raised by the prospectors who commenced the mine.

The Chief Inspector of Mines (Mr. W. H. Matthews) reports (August, 1907) :—The property comprises 400 acres, being portion of 700 acres of freehold land held by the previous company, which was worked from 1849 to 1851, when the mine suspended operations in consequence of the men leaving for the Victorian gold-fields, and others not being obtainable. Nothing further was done until 1872, when the main shaft was partially unwatered to procure samples of the lode matter, which were forwarded to England for examination. In September, 1905, the mine was inspected by a representative of a strong English company, and the property was, I have been informed, floated in England with a working capital of £90,000. The developments have disclosed two principal formations, known as the N. and S. lodes, being approximately 1,000ft. apart, each striking about E. and W., slightly underlying N., and from the appearance of the old workings above the 80ft. level must have yielded a considerable quantity of lode matter containing a fair amount of copper, the higher grade material apparently making in short lenticular blocks dipping E., with low-grade material both above and below trending in the same direction. With one exception all the development work at present in progress is being continued in or from the old workings, and consist of enlarging, timbering, and deepening shafts, extending drives, winzes, and other work, such as the erection of the various poppet-heads, machinery, and other appliances.

South Lode.—Painter's shaft has been enlarged from the surface down, securely timbered, and sunk to the depth of 150ft. At 128ft. from the surface the shaft passed through the lode matter entering footwall country rock, proving the ore-bearing material to be underlying N. about 1ft. in 8ft. It is decided to continue the sinking another 7ft., then crosscut N. until the lode has been passed through. At the 60ft. level previous workings extending E. from the shaft have exposed a portion of the lode 5ft. wide, disclosing in places blue and green carbonates of copper, with lesser quantities of chalcocite. At this point the lode formation on the surface appears to be very broken, and is of considerable width ; but until the contemplated crosscut at the 157ft. level is accomplished its actual width and value must remain undetermined.

East Shaft.—This is sunk 22 chains E. of Painter's shaft, apparently on the same line of lode. The present depth is 60ft. from the surface. The width of the formation is not known, and consists principally of quartz and hornblende schists intermixed. The material in places shows small splashes of yellow ore, but up to the present no development of any importance has been disclosed. It is intended to continue sinking to the depth of 120ft., then crosscut through the lode at the same level as the crosscut in Painter's shaft.

Winze.—About 750ft. W. of Painter's shaft a tunnel has been driven from the N. side of the hill, intersecting the same lode at 300ft. ; a drive then extended W. on the course of the lode 150ft. The present company have now sunk an underlie winze from the bottom of the drive 60ft., disclosing siliceous lode matter 3ft. 6in.

wider, containing for about 15in. thick, ore of good average value on the footwall side. Two samples—one bulk, the other sorted—gave a return of 4.6 per cent. and 24.8 per cent. of copper respectively. The remaining portion of the lode is at present of rather low value, but may improve as the winze is continued, which at present has a very favorable appearance.

North Lode : Engine Shaft.—Present depth is 200ft. on the lode underlie, with drives opened out at the 40ft., 100ft., and 200ft. levels.

Forty-foot Level.—At this point the lode has been worked for about 50ft. in length, and stoped from that level to near the surface by the former company or tributers, and from which, I was informed, a fair quantity of high-grade material was extracted. From this level a winze has also been sunk to the depth of 60ft., exposing siliceous lode matter from 5ft. to 6ft. wide, the copper contents being of fair value, occurring in veins and splashes throughout the matrix. This, apparently, is one of the lenticular ore-bearing blocks that occur at various points in the lodes dipping E. at an angle of about 45°.

One Hundred-foot Level.—This drive has been advanced E. 60ft. The lode, where cut through, is from 16ft. to 19ft. wide, consisting of hard siliceous matter in places containing small splashes of yellow ore, but at present is of little or no value beyond showing the presence of that metal.

Two Hundred-foot Level.—Drive at this point has been extended E. 45ft. from crosscut. Lode and character of the material is similar in every respect to the level above. Each of these drives is being continued, with the object of intersecting the ore body mentioned as existing in the winze at the 40ft. level.

Whim Shaft.—This is some short distance E. of the engine shaft on the same line of lode, and is said to have reached the depth of 120ft., and a quantity of high-grade material previously extracted, but in consequence of the water standing to within 20ft. of the surface it could not be examined. Preparations to unwater this portion of the mine are now in progress by the erection of a new poppet-head and air winch.

The principal mine equipment consists as follows :—Three multitubular boilers, 16ft. long by 5ft. 6in. diameter ; Rand-drill air compressors, 14 by 22in. stroke ; pair horizontal air compressors, 18 by 3ft. stroke ; screw cutting lathe, 12ft. bed centre. Painter's shaft—Coupled horizontal winze type winding engine, complete. Engine shaft—Pair horizontal coupled winze type winding engines, complete, Cornish boiler, 23ft. long by 5ft. 6in. diameter ; steam pump, capacity 3,200galls. per hour ; Hope rockbreaker, 16in. jaws, the whole being securely housed and protected.

Buildings.—These comprise engine-houses, manager's residence, offices, store-rooms, assay laboratory, and workmen's buildings, all constructed in the most neat and substantial manner.

Future Developments.—Further to develop this property it would be advisable to carry out the works indicated, namely, on the S. lode, crosscut through the formation in Painter's shaft, at the 157ft. level, also continue the winze mentioned as being sunk 750ft. W. of Painter's shaft, and crosscut through the formation in the 60ft. shaft situated E. of Painter's workings. The N. lode should be further explored by continuing the drives E. at the 100ft. and 200ft. levels in the engine shaft to ascertain if the ore body at the 40ft. level will reach that depth or otherwise. From my examination of the present workings, it is evident the copper contents of the ore exposed in bulk are of rather low value ; but, until the suggested development work is accomplished, it would be premature to form an opinion of the actual value of the mine, which possibly may improve as the works progress.

Men Employed.—Number of men employed ranges from 85 to 100. (I.M.R., 23-8-07.)

PARINGA MINE.—This property is in the neighborhood of the Bremer and Kanmantoo mines, 36 miles from Adelaide. About 900 tons of ore, it is said, were raised by tributers in the early days, who ceased work when they came to the water-

level. The Inspector of Mines, reporting on December 21st, 1899, states that until recently the mine had been abandoned for many years; consequently the lower levels in the old workings are full of water and could not be examined, but many portions of the lode are exposed, and the recent workings have opened up a portion of the ground to the depth of 70ft. The locality is very convenient, being close to the railway line, from which a siding could be constructed at a very small expense. The mine is situated in a series of rocky elevations, almost surrounding a small valley, through which runs the Paringa Creek. The main formation is close to the railway line, on a spur of the range rising abruptly to the height of 70ft. above the level of the creek; through the centre of this the main lode strikes E. and W., and has been worked to various depths for fully 100yds. in length, and towards the E end for about 3 chains in width. Judging from the workings, and portions of the lode which can be seen, it varies from 2ft. to 6ft. in width, and on each side there are other parallel veins or lode formations, on which a large amount of work has been done, and a quantity of copper ore extracted, the higher grade occurring chiefly in veins, pipes, and chimneys, principally where quartz veins cross the metal-bearing strata. At the foot of the rise the present main shaft has been sunk to the depth of 70ft., the lode in the bottom being composed of mica schist, containing black oxide and yellow ore. A sample taken gave a return of 5dwts. gold and 10½ per cent. copper. A little above the bottom, a drive is in progress to unwater a portion of the old workings. A sample taken from various portions of the face gave 3½ per cent. From the small amount of work accomplished at this particular point, it is difficult to determine the exact width of the lode, either in the shaft or drive, but it is apparently fully 3ft. wide. About 200yds. N.W. there is a second lode formation, from 4ft. to 6ft. wide, containing green carbonates and grey ore; it is being worked by tributaries, and returning ore of 16 per cent. to 18 per cent. value. The better grade ore occurs here, as in the other workings, where the quartz veins cross the ore bodies. A sample of azurite, malachite, and copper glance taken from about 20ft. from the surface assayed 15½ per cent. The Giant's Grave lode, which is W. of the old engine shaft, has been worked for a considerable length, and, according to old records furnished, to a depth of 240ft. The total output for the mine for the 13 years prior to 1886 was, so far as could be gathered, over £25,000 in value. From old surface operations there is evidence of other lodes and veins traversing the property, but, in most instances, owing to the water, they could not be examined. Previous to deciding on the best mode of reopening the mine, it would be advisable to enlarge and sink the present shaft to sufficient depth to unwater the workings of the main lode, which has every appearance of being permanent and continuous, and further explorations are fully warranted. (I.M.R., 21-12-99.)

In a further report it is stated:—The property comprises 173 acres of freehold land, situated 2¼ miles from Callington Railway Station, the line in one portion passing through the holding. The rugged portions of the property are traversed by a large number of lodes, veins, and leaders, almost all more or less copper-bearing, the enclosing rocks being chiefly schist, sandstone, and garnet rock. The lodes contain blue and green carbonates, grey ore, and, occasionally, red oxide; in some places the former gives place at the water-level to yellow and black ore, which occurs in veins and bunches; the lodes and veins strike in various directions, some E. and W., others N. and S. Towards the E end of the workings, Turner's shaft has been sunk to the depth of 77ft. At the time of the inspector's visit it was difficult to ascertain the width of the lode in the shaft bottom, but it was apparently from 5ft. to 6ft. thick, containing bunches and veins of black oxide and yellow ore of a very promising nature. Giant's Grave lode is about 10 chains E. of Turner's shaft. On the E side of the range other lode formations exist, supposed to be the continuation of the Kanmantoo line. Towards this a tunnel has been driven 200ft., passing through the lode at 136ft.; drives have been extended N. and S., and winzes sunk, but the greatest portion

of the workings have fallen in; only small pillars of the lode can be seen, containing a little ore, but nothing of much importance in sight. Mining operations are at present confined to a shaft 40ft. deep, about 2 chains N. of Turner's shaft. The formation, which is very siliceous, is from 4ft. to 5ft. wide, containing carbonates, grey ore, and small seams of red oxide, of good value. There are about 5 tons of dressed ore on the surface, and since the present syndicate resumed work over 49 tons of ore, giving an average value of a little over 18 per cent. of copper, have been raised and forwarded to market. For the future development of the W. portion of the mine, Turner's shaft should be enlarged and sunk to the depth of 200ft., then crosscut slightly W. of N.; this would intersect almost all the veins and lodes from which large quantities of ore have been previously obtained. To reopen the E. portion of the mine, such as the Giant's Grave and other lodes in the vicinity, the main shaft, which is said to be 240ft. deep, should be cleaned out, timbered where required, and put in proper order, or a new one sunk further N., some short distance from the old engine-house. These works will require a fair amount of capital, but the past returns and general outlook of the property will justify the outlay as a fair mining venture, with every reasonable chance of success. Samples of dressed ore returned 33 per cent. and 29 per cent. copper respectively. (I.M.R., 17-9-00.)

PAULL'S CONSOLIDATED (formerly known as the "Friend Copper Mine").—Locality, about $1\frac{1}{2}$ miles N. of Burr Well, on Burr or Finke Creek, Mount Lyndhurst district. The Government Geologist examined it early in 1897, and his report stated that shallow shafts had been sunk at intervals, and cuttings made for 50 or 60 chains along the outcrop, which runs in an E. and W. direction on the S. flank of a long range. At the W. end small veins of rich copper glance occur in claystone and sandy clayslate. The main shaft had been sunk 40ft. through vertical claystone, in the bedding of which there is a thin vein of copper glance and carbonate of copper, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. thick, accompanied by a band of copper-bearing claystone 6 in. to 8 in. thick, with thin bands of copper glance, and copper ore is seen in the surrounding country rock. These have every appearance of going to a depth. E. of this shaft is an open cut made in the vertical strata of flaggy slate and claystone, in which occur bedded veins of copper glance and red oxide of copper, with sometimes native copper. Ribbon-like bands of copper glance inter laminate the slate, and are distributed through it. Further E. calcareous claystone is stained with carbonate of copper, and shows copper glance. Shaft No. 1, on the centre block, 12ft. deep, shows that claystone is penetrated by copper ore for a width of about 7ft., and contains thin interbedded veins of copper glance and red oxide, with cross veins. Further E. surface prospecting had exposed copper-bearing slate, with small veins of copper ore. The general strike of the copper-bearing rock is E. and W., conformably with the country rock, claystones and sandy clayslates. The ores are very rich in copper; the lode formation is not large, but will probably continue to a considerable depth, and a payable mine is likely to be developed by systematic prospecting. Return to end of December showed that the deepest shaft was 72ft.; average value of ore, 10 per cent. for copper. (1899 edition.)

Near the end of 1899 the Inspector of Mines reported:—Situated on a strong and continuous range, rising 150ft. above the level of the surrounding country, the lode, which strikes E. and W. and underlies to the S., can be traced the full length of the property by outcrops and surface trenches, which are opened out in various places along the line, proving it to be continuous. For about 20 chains in length numerous shafts have been sunk, ranging from 15ft. to 100ft. in depth, proving the lode formation to be from 2ft. to 10ft. wide, containing green carbonates and grey ore, which occur throughout the matrix in streaks and narrow veins. The shaft in which work was in progress at the time of the inspector's visit had been sunk 54ft., the lode formation being from 4ft. to 5ft. wide, containing fair-grade ore to the depth of 30ft., sample giving 22 per cent. copper. Beneath this, and until within a few feet of the bottom, the material is poorer, and contains a

large percentage of iron. Near the bottom the ground is again changing to the previous copper-bearing material. The inspector noticed the peculiar formation of bands of ironstone gossan, at various points, crossing the lode material, and where these appear the lode is of poor quality, and continues so until the white clayslate is again intersected, when the grade becomes higher. It was intended to continue this shaft to the 150ft. level before driving, which is the proper course to adopt for development purposes. There appeared to be a large quantity of lode material, portions of which could be hand-dressed up to 20 per cent. and 25 per cent., and the remainder, with the aid of proper appliances, can be made payable. From time to time a large quantity of ore of high value has been extracted, and a quantity of seconds on the surface will eventually pay for treatment. Sample taken from the shaft gave 22 per cent., and from the workings further W. 23½ per cent. (I.M.R., 21-11-99.)

Vanadium ore, in the form of yellowish-green stains and coatings in the joints and crevices of the copper-bearing slate rock and in small vughs and crevices in the copper ore, has been found here in 12 different places along the lode for a distance of ½ a mile. So far it has not been obtained deeper than 18ft. (G.G., 21-4-04.)

A further report from Inspector Matthews, dated September 30th, 1906, states:—This property is located about 27 miles from Leigh Creek. The workings consist of a large number of shafts, open cuttings, and trial pits, the former ranging from 20ft. to 300ft. in depth, extending on the line of lode fully ½ mile in length, with drives, crosscuts, and winzes opened out at various points. The lode strikes about N.E. and S.W., with a S. underlie of 30°. Enclosed within clean and unbroken walls, the formation principally consists of claystone and ferruginous matter containing ore veins and seams of ore of various descriptions; near the surface being chiefly green carbonates, in the form of what is locally known as ribbon ore; towards the deeper workings this has given place to grey ore and red oxide, associated with a considerable quantity of iron. Main shaft.—This is an inclined shaft sunk to a depth of 300ft., with drives and stopes opened out at the 90ft., 150ft., 200ft., and 250ft. levels. At the 250ft. level a drive has been extended E. on the course of the lode 190ft., the lode formation being from 1ft. to 5ft. wide, containing ore of very fair value in seams and bunches. 200ft. level.—At this point a drive has been made 60ft. E. through the usual class material, being apparently on a parallel shoot, and has been worked for 14ft. wide. The filling up of portions of the depleted stopes is now in progress, to enable stoping to be continued from the level upward. In this portion of the mine a considerable amount of work has been accomplished. The W. drive has been advanced 318ft., the lode matter being of low value, except towards the W. end, where the drive has apparently penetrated one of the ore shoots exposed in the workings above. At 248ft. W. of the shaft the lode matter has been proved to be 18ft. wide, containing veins and seams of ore ranging from 1in. to 4in. At the 90ft. level preparations are being made to stope towards the surface. At this point the lode matter will average 6ft. wide, and from general appearances should give fair values. The machinery consists of a winding and pumping plant combined, and a concentrating plant consisting of Cornish horizontal boiler, rock-breaker, crushing rolls, one May's five-compartment jig, elevator, grinder, and May's patent vanner. The whole plant, with one or two exceptions, to which the manager is directing special attention, appears to be working well; but, owing to the character of the material treated, it is difficult to obtain a very close extraction. Possibly it would be advisable, when the ore is being broken, to sort and dispatch direct to the smelters the veins and bunches of high-grade ore that are frequently encountered, and from the remainder separate, so far as possible, at a reasonable expense, the waste material from the fine and lower-grade matter; the former would then be utilised for filling the depleted stopes, and the latter sent to the mill for treatment. This would lessen the quantity of material passing through the mill; but, as the loss is at least 2 per cent. on each ton treated, it becomes a question if the average returns would not be of greater

value by decreasing the total loss in the tailings on each week's operations. At present there is a considerable amount of dead work in progress which will soon be completed, when, without any or little additional cost, the output can be increased. The further sinking of the main shaft should then be continued, as the bottom workings give indications of approaching the sulphide zone; and by sinking another 100ft. probably the W. shoot of ore would be exploited, and the anticipated change encountered. Notwithstanding the ore shoots being some distance apart, they have been persistent in their courses towards the deeper levels, and I see no reason why they should not continue. Samples taken at various points give the following results:—No. 1 W. drive, 150ft. level, formation 14ft. wide, ore veins from 1in. to 4in., 9.1 per cent.; No. 2 E. drive, 150ft. level, ore vein, 26.5 per cent.; No. 3 E. drive, 250ft. level, ore vein 8in. wide, 10.2 per cent.; No. 4 E. drive, 250ft. level, iron and ferruginous clay, 1.2 per cent.; No. 5 E. drive, small seam tried for vanadium, nil; No. 6, tailings after passing through concentrating plant, 2 per cent. (I.M.R., 30-9-06.)

Owing to the loss in the concentration of this ore, operations were suspended. (1907.)

PAULL'S NORTH EXTENDED.—Situated about 3 miles N.W. from Paull's Consolidated Mine. An open cut has been made 45ft. long from the approach, and near the face a shaft has been sunk 15ft. below the floor of the cut, and at the bottom of the shaft a drive extends N. 55° W. for 72ft. These workings disclose a kaolinised sandstone, which carries interstratified seams of copper glance and carbonate, associated with quartz, varying from a mere thread to 9in. in thickness. In one place, where a small crosscut has been put in, these small veins, with a little prill and copper stains, are visible in the sandstone for a thickness of 15ft. About 4 chains E. from the main workings a vertical shaft has been sunk 30ft., to cut the copper-bearing country. Two and a quarter tons recently sent away returned 36 per cent. of copper. (George, 27-8-02.)

PINNACLES (Mount Fitton District).—Situated about 3 miles S.W. of the Fitton South Mine. Portion of the lode outcrops several feet above the surface, the footwall side being strongly stained with green carbonate of copper. An underlie shaft has been sunk to the depth of 70ft., on the footwall side; the vein of ore is from 6in. to 18in. wide, and consists chiefly of grey ore and carbonates. An average sample taken from the shaft bottom, where the lode is 15in. wide, gave a return of 26 per cent. At the 40ft. level a short drive has been put in to the N. The ore vein in the face is 8in. wide, and of very good quality. Up to the time of inspection, 11 tons of 29 per cent. ore had been sent to the smelters, and there were 10 tons remaining in the ore dump worth concentration. Trial pits and cross trenches have been made for some distance along the line of lode, and in each instance encouraging prospects of carbonates exposed, which should be prospected while ore is being raised from the deeper shaft. (I.M.R., 2-8-99.)

PINNACLES (Yudnamutana).—Two shafts have been sunk 140ft. and 40ft., following the lode on the underlie; also several small pits and costeans on the lode and in other places on the claim, where copper ore and stains are visible. The main shaft, 140ft., is inclined at an angle of about 48°. From 70ft. upwards to within 15ft. of the surface the lode has been stoped out for a length of 30ft., and the ground secured. Below the 70ft. level the lode is well defined and regular, and varies from 1ft. to 3ft. in thickness. It is poor in copper, but carries a vein of copper glance and carbonates from $\frac{1}{2}$ in. to 6in. thick, which appears to be improving in size at the bottom of the shaft. No. 2 shaft, 40ft. deep, is about 2 chains N.E. from the main shaft. The lode varies in it from 1ft. to 3ft. 6in. wide, and consists of quartz, gossan, and argillaceous matter, carrying small seams of grey ore. At the bottom, what appears to be a smooth hanging-wall is showing. No footwall has been disclosed. The lode strikes N. 50° E., and underlies S.E. at an angle of 48°. (George, 27-8-02.)

A later report states that a drive had been put in at 25ft. from the surface and some stoping done. A shaft, 20ft., had been sunk on a small vein of quartz and gossan, containing small bunches of low-grade ferruginous copper and carbonate. The mine was unworked. (4-3-04.)

It is now held, in conjunction with the Yudnamutana, by the Union Copper Mining Company. (1907.)

PEELBOX'S CLAIM.—Situated about 10 chains W. from Depot Springs. An open cut 20ft. long, 5ft. deep, and a pit 6ft. deep from the bottom, disclose a siliceous formation carrying seams and bunches of high-grade copper ore with carbonate and a little ruby oxide. Sufficient work has not been done to determine the course and thickness of the formation. A few tons of ore had been sent away. (27-8-02.)

PERNATTY LAGOON (Gunya).—Held by Messrs. Young. About 2 miles N. of Mount Gunson Mine and E. of Mount Gunson hill, in an arm of Pernatty Lagoon. The workings have been opened on the lagoon bed a few chains from the shore, about 50ft. below the tops of the low hills surrounding. They extend over about a mile in length E. and W., have a greatest width of about 4 chains, and consist of a large number of shallow pits and excavations. Owing to wet weather at the time of inspection the holes were full of water and the surface of the lagoon boggy, but the spoil heaps showed that more or less copper ore had been obtained in all of them from horizontal beds resting on the underlying sandstone rock. Examination of an unwatered hole showed that the surface immediately under a few inches of mud consists of 14in. of ferruginous sandstone, carrying green carbonates; beneath this is about 4½ft. of grit, irregular portions of which are heavily charged with grey copper ore, a sample taken assaying 25.5 per cent. copper. The bottom is red sandstone of uneven surface, and carries pockets and layers of grey ore. Sample from the bottom assayed 18.6 per cent., and a portion from a large sample obtained from a hole in the E. portion of the workings assayed 50.6 per cent. copper. Small veins of green carbonate also traverse the sandstone in places. About 60 tons of ore averaging 16 per cent. have been sent to market, and from 55 heaps near the dressing-floor, from which the best ore had been picked, a general sample assayed 8.1 per cent. It is very evident that at this place there exists a large, valuable, and easily worked deposit of copper ore, and the probabilities are that, outside of the lagoon bed already prospected, further discoveries will be made. Moreover, it is possible that other deposits exist beneath the sandstone, and this should be tested by sinking. (D.R. (Gee), 11-7-06.)

PINE POINT (PHILLIPS').—The property known as Phillips' Copper Show is located at Pine Point, about 8 miles S. of Ardrossan. The workings consist of one shaft sunk to the depth of 40ft. and a small tunnel driven in the side of the cliff about 15ft., slightly above high-water mark, with winze sunk from the latter to about 20ft. in depth, disclosing copper-bearing material for about 15ft. wide. The material consists of country rock in places containing small nodules of green carbonates of copper of no particular value beyond giving an indication of the presence of that metal. Sample taken from the green carbonates picked out yielded slightly over 8 per cent. copper. Future prospecting in this locality should consist in trying to locate the ore-bearing material in more elevated ground, and not, as at present, on the foreshore just above high-water mark, where, if at any time should developments prove favorable, a strong influx of water might be encountered that would probably cause the suspension of all operations. (I.M.R., 30-4-07.)

PINE POINT (LEASE 1935).—This property comprises 40 acres, extending for about three-quarters of a mile in length, situated on the foreshore in the vicinity of Pine Point, 8 miles S. of Ardrossan. From the high-water mark the cliff rises abruptly to the height of about 50ft., exposing large and almost unlimited clay deposits of various shades and quality, free from deleterious matter, and highly suitable for the manufacture of pottery, tiles, and other articles of that description. The material shows for some considerable length, and can be extracted at the least possible cost, by simply quarrying from the cliff face, and delivered in small ketches

or lighters suitable for dispatching the material to the various manufacturing works or for export to any of the other States. Continuing on the beach, almost the full length of the property, there are large blocks of brown hematite iron, giving every indication of a large iron deposit striking parallel with the sea coast in that vicinity, which is possibly overlain by alluvial, as is shown by a narrow gorge or washout that has occurred in one portion of the cliff, exposing ironstone of considerable width. Samples taken from this and several of the large blocks mentioned returned from 47 per cent. to 58 per cent. of iron. In various parts there are also indications of copper. A little work has been done towards the S. end of the lease, exposing ferruginous rocks in places, highly copper-stained with streaks of green carbonates. Samples of the latter returned slightly over 3 per cent. copper. With the object of further testing this property, a small and inexpensive tunnel might be driven from the face of the cliff. This would thoroughly test the property as to the existence of any additional iron or copper deposits that may be overlain with clay or other matter. In regard to the clay deposit, it is evidently a valuable proposition that with anything like a reasonable market would become highly remunerative. (I.M.R., 30-4-07.)

PINDELPANA.—Situated on the Paralana Range, W. from the Yudnamutana Mine. Ironstone rocks impregnated with copper, both green carbonate and grey ore, the lode running nearly E. and W. for 70yds. or 80yds., and varying in width on the surface from 2ft. to 6ft. The geological appearance of the ground is singular, the following substances being all found within a few rods:—Ironstone, granite rock, greenstone, disintegrated quartz rock, felspar, limestone, micaceous schist, and some beautiful small crystals of quartz. (Austin, 1863.)

POONA.—This mine is situated very near to the Moonta Mine, and its discovery was due to the exposure of a lode by the excavation of a rather deep cutting on the Moonta and Wallaroo tramway. It was regarded as a very promising mine, and sent away a considerable quantity of marketable ore. It was one of the very many small mines that ceased work during the depression in the copper market in the '70 decade. The Inspector of Mines, in his report in December, 1890, described this mine as situated adjoining the Paramatta Mine, and the property as consisting of 240 acres. There were two shafts, one said to be 120ft. and the other 228ft. deep, on the course of the lode. The spoil heap exhibits quartzite, felspar, and porphyry. A sample from the heap gave 27½ per cent. for copper. It is purposed to work this property in conjunction with a number of other mines in its vicinity. (February, 1899.) Afterwards called the "Poona and Mattapara."

Previous to shutting down, in 1870, a large quantity of fair-grade ore was extracted, work having been in progress for some years. In the Poona portion, which adjoins the Paramatta, two shafts have been sunk, one on each side of the railway line, the main, or W., shaft being 228ft., and the other 120ft. in depth, both on the line of lode, which trends E. and W. Judging from the large quantity of waste material on the surface, a considerable amount of driving and stoping must have been done prior to suspension. It was stated, and on very good authority, that in the workings of each shaft there are two parallel lodes, about 50ft. apart, each containing good ore in the bottom levels, the S. one being generally the better, and ranging from 2ft. to 12ft. in width, the ore dumps and waste material are chiefly quartzite and felspar, with green carbonates, grey ore, and malleable copper distributed throughout. About 6 chains E. of the workings a shaft has been recently sunk to a depth of 85ft., passing through the N. vein, 2ft. 6in. wide, but at this point it is only copper-stained. This shaft should be continued until the second vein, which has always proved the more valuable, is intersected. Towards the E. end of the property, known as the Mattapara, and apparently on the same line of lode, a shaft has been sunk 100ft. deep. The lode formation is siliceous, with a larger proportion of iron and fragments of yellow ore, but the shaft is not yet deep enough to cut the main ore bodies. To reopen the old workings on the Poona, the inspector recommends that a main shaft be sunk, some distance

W. and slightly to the N. of the old one, to the depth of at least 320ft. This would leave about 100ft. of unexplored ground, and be directly underneath the main shoots of ore. A large quantity of waste material, containing more or less copper, is on the surface, and would probably pay to sort and dress. The railway passes through the property, and provision has been made for a siding when required. It may be regarded as a fair legitimate mining venture, and, with the necessary amount of capital, has every reasonable chance of success. (I.M.R., 17-7-00.)

PREAMIMMA MINE.—This mine is situated about 6 miles N.E. from Callington, and was opened in 1854. Some good ore, chiefly carbonates, was raised, but the lode being lost, the mine was abandoned. It was reopened for a short time about the year 1862, and the engine shaft was sunk to a depth of 47 fathoms. Some black ore was found, but not in paying quantities. Mundic was met with throughout the workings, and also some muriate of copper. (Austin, 1863.)

In 1899 Mr. G. W. Sudholz restarted operations on this property. The Inspector of Mines, reporting in October, 1901, states that the outcrop on the surface N. of the present workings shows copper stains for a considerable width, and is apparently the commencement of the shoot of ore worked by the previous companies. It strikes N. and S., with a W. underlie, the main ore body appearing to dip S. S. and W. of the lode outcrop the main shaft has been sunk to the depth of 300ft., entering the lode formation, from 12ft. to 14ft. wide, composed of micaceous slate, sandstone, quartz, and a vein of arsenic ore, from 1ft. to 2ft. wide on the footwall. The balance of the lode also contains some arsenic and copper stains, chiefly on the hanging-wall portion. From this point a drive extends 150ft. At 100ft., where the lode has apparently faulted, stoping has been done for about 25ft. in height. At the same level a drive has been made a few feet S., but is at present in country rock. This should be continued until the lode is pierced, then driven S. with the object of cutting the shoot of copper ore first worked from the surface, should it continue down. There are other old workings above the level, of which no detail examination could be made. Samples of the ore raised from the stopes gave on assay:—

Arsenic vein, fine grained	45	per cent. arsenic
Arsenical pyrites and quartz	18	"
" coarse grained	31	" 6dwts. gold.

These show that the lode is valuable for arsenic, but poor otherwise. Winding and concentrating plants have been erected on the mine, the concentrates being disposed of at arsenic value only. (I.M.R., 26-10-01.)

Mr. Sudholz forwarded 300 tons of 40 per cent. ore, which realised £7 10s. per ton in England. A sudden drop in the price of arsenic caused operations to be discontinued. He states that there is abundance of high-grade arsenic ore in this mine.

Operations have been recently resumed here and returns for the 12 months ended June 30th, 1907, show that 55½ tons of 9 per cent. copper ore have been treated, and also 4 tons of 38 per cent. arsenic ore raised.

PREMIER COPPER MINE.—This mine is situated about 1½ miles from New Luxemburg and from the Mingary and Queen Bee gold mines. A vertical shaft has been put down, and (says the Inspector of Mines) at about 11 fathoms it reached a very heavily mineralised country, with thin veins of sulphides interlacing in all directions. The indications are very favorable, and it is considered an excellent prospect. The lode sunk upon is said to carry silver in small quantities. (1889.)

PRINCE ALFRED MINE.—Situated 28 miles N.E. from Carrieton Railway Station. The ore deposit is very interesting on account of its presenting a fine example of the so-called bedded or layer lode, i.e., it lies both in strike and dip between the strata—grey flaggy clayslate. The strike is variable, being N. 14° E. for

120ft., N. 9° E. for 100ft., N. 22° W. for 95ft., and N. 10° E. for about 150ft., and dips W. 45° to 50°. It has been traced for nearly 20 chains in length, showing, as far as exposed, a thickness varying from 3ft. to above 20ft. The deposit consists of a confused accumulation of large and small masses of clayslate connected and traversed by veins of calcite. Through this mass malachite is thickly distributed in seams, coatings, and irregular patches, associated with brown iron ore. Towards and below the water-level, at about 20 fathoms, the green carbonate and brown iron ore give way to a dense impregnation, fine veins and massive aggregations of copper pyrites, but slightly intermixed with iron pyrites, and occasionally associated with small particles of spathic iron and white calcite. In one place the lode is very rich, and is taken out for nearly 20ft. in width. The distribution of the copper ore is not uniform, but varies in richness throughout the workings. (Ulrich.) Three shafts were sunk in different places on the property, but only one at the principal workings. Large stopes were opened out from the surface down to about 20 fathoms. The greatest depth of any shaft was about 40 fathoms on the underlie, and the water-level was reached at 150ft. Drives were put in for some hundreds of feet. The mine stopped work in 1872. In 1889 limited operations were in progress, the main effort being apparently to make the mine pay its own expenses. The prospect was very encouraging, and deserved a liberal expenditure of capital, according to the Inspector of Mines, who visited this property (1889), and, in his report upon it, says that "working as it is at present, under difficulties, on a small scale, and with primitive raising appliances, the mine pays excellently; with a plant capable of dealing with a large quantity of ore it would pay handsomely and become an important undertaking." The lode is a very large one, ranging from 12ft. to 20ft., and through the whole matrix there are veins of very rich ore distributed irregularly. The course of the lode is N. 10° E., with a dip W. at an angle of 45°; it can be traced for a mile, and has been opened on the N. boundary, where a small but compact lode of high-grade copper ore is shown. In February, 1899, the Government Geologist reported having again examined this property, and describes the lode as being of a bedded character, associated with spathic iron in veins, and calcspar and brecciated rock; and copper is distributed irregularly through the whole mass. He describes the shafts, but the workings being under water, personal examination was impossible; but he was of opinion that the lode was a strong and permanent one, justifying systematic and exhaustive exploration at deep levels, and the employment of systematic methods of mining.

A report in October, 1901, states that the mine had been unwatered, and that work was in progress at the 170ft. level in the main shaft, where the lode attains a thickness of 30ft. and consists of calcareous slate traversed by innumerable small irregular veins and bunches of calcite; through this formation copper pyrites and a little mundic is plentifully disseminated in bunches and small veins, principally in the calcite. Below the 170ft. level the lode appears to be faulted. Machinery, including a concentrating plant, has been erected. The ore is very suitable for concentration, a sample of the tailings from the jigs gave a return of 0.7 per cent. copper only. (George, 18-10-01.)

During the first six months of 1902, 1,608 tons of crude ore were put through the concentrators, producing 207 tons of 24 per cent. concentrates. Operations have continued to date, and returns have been satisfactory. (1907.)

PRINCESS ROYAL MINE.—The discovery of this mine preceded that of the Burra, which it adjoins, and which was found shortly afterwards.

The original property holding of the company was the S. half of the Burra Special Survey, of 20,000 acres. Working was commenced nearly at the same time as the Burra, and with considerable success, a large quantity of ore averaging over 27 per cent. being raised and shipped to England, one parcel being over 29 per cent. Operations were carried on until the year 1851, when water was cut at about 30 fathoms; and the capital of the company being expended, as well as the proceeds of the ore, the shareholders determined to abandon the mine and sell their freehold of 10,000

acres. This realised £9,000, the total proceeds of the ore raised were over £7,000, and the concern ultimately paid a dividend of about thirteen shillings in the pound on the original cost and outlay. The opinion is expressed that this mine may yet prove to be of considerable value. (Austin, 1863.)

QUEEN BEE MINE.—Situate at New Luxemburg, adjoining the Lux Gold Mine. The reefs run parallel and N.E. about 800ft., and attain a width of 7ft. or 8ft. in places. The Inspector of Mines reported that the rocks of the locality are metamorphic and intrusive, and it is probable that besides the eruptive granite, dioritic dykes will be found in sinking. The geological structure of the country is very similar to that of the Barrier, and shows a continuation of the same formation. The reefs are situated near the boundary of the granite and metamorphic rocks and slate, and the formation is similar to that in the Yudnamutana and Neales River districts, where gold has been found. The quartz lodes in this locality are largely developed and permanent in appearance, and a low average yield of gold will pay better than a high average where the reefs are small. He also reported, as a result of a later visit to this mine, that on a strong outcrop of quartz three shafts had been sunk, and samples panned off showed excellent prospects. The reef carried bunches of carbonate of copper, and free gold could be seen in the stone. The average width of the reef was 3ft. 6in., with a dip of 1ft. in 22ft. Samples selected by the Inspector gave an average of $1\frac{1}{2}$ ozs. of gold per ton. Samples taken on a second visit, and assayed by the Government Assayer, gave (1) copper 35 $\frac{1}{2}$ per cent., gold 16grs.; (2) copper 27 $\frac{1}{2}$ per cent., gold 2dwts. 6grs.; (3) copper 18 per cent., gold 10dwts. 10grs.; and (4) copper 3 $\frac{1}{2}$ per cent., gold 4dwts. 2grs. During 1890 another visit of inspection was paid. Ore was being raised and bagged, the last parcel sent assaying in bulk 1oz. 10dwts. gold and 9ozs. silver per ton, with 32 $\frac{1}{2}$ per cent. of copper. In 1897 the Government Geologist examined the mine and reported that there was a well-defined lode about 3ft. wide, at a depth of 270ft., which carried gold and copper. His report was to the effect that at the 200ft. level there is a quartz lode, varying in thickness from 3ft. to 4ft., containing in places rich shoots of copper ore, and also very promising for gold. There was every prospect of making it a payable copper mine if developed properly.

RAMSAY'S SHOW.—Situated to the W. of Pernatty Lagoon. In some low hills here a pit has been made through sandy ground, and at a depth of 8ft. a flat calcareous formation 2ft. thick, carrying green carbonate ore, is exposed—1 ton 18cwt. of ore dressed from this was worth 13 per cent. copper. This formation could probably be worked better from lower down the hill. Ramsay also had a claim, now purchased by the Mount Gunson Company, on the lagoon bed to the E. of those held by Messrs. Young, from a shallow excavation on which he sent away 2 tons of 15 per cent. sulphide ore. (D.R. (Gee), 11-7-06.)

RAPID BAY.—*Vide YATTAGOLINGA*, page 155.

REEDY CREEK.—*Vide KITTICOOOLA*, page 70.

RAWNSLEY'S BLUFF MINE.—Situated about 14 miles E. of Mernmerna (Great Northern Railway), and S.W. of the Bluff itself. A strong reef of ironstone shows on the surface for 250yds. or 300yds., and contains some good stones of green carbonate of copper. (Austin, 1863.)

RHONDDA MINE.—Situated on section 48, 4 miles N. from Carrieton. Worked many years ago for a brief period only, leaving no record of results. Strike of lode E. and W., dip 33° S. The workings, which are now in a dangerous condition, have followed the inclination of the lode 180ft.; it appears to be only a few inches thick. Two men were fossicking, and the ore obtained was of poor quality. (Government Geologist, February, 1899.)

RHYNIE MINE.—Situated 4 miles W. from Riverton. A copper mine having rich indications was worked here by Messrs. Nickolls Bros. in 1867.

RED HILL MINE (also known as "Bock and Broadbent's").—Situated 36 miles N.E. of Carrieton, and 8 miles E. of the Prince Alfred Mine. The locality is a low line of ridges, chiefly covered by alluvial, which overlays the lode formations. The workings comprise a number of small shafts, cross trenches, and trial pits, ranging

from 4ft. to 100ft. in depth, extending from point to point fully $\frac{1}{2}$ a mile in length, and exposing the formation from 1ft. to 6ft. in width, striking N.E., with an E. underlie of about 2 in 6. Towards the S. end of the property a shaft has been sunk 50ft. on the underlie, exposing lode matter the full depth, but at the present level being broken and disturbed, containing bunches of blue and green carbonates of copper and grey ore. The size of the formation at this point is not yet determined, but is exposed for fully 6ft. in width. About 6 chains N. the deepest shaft has been carried down to the depth of 100ft., or slightly below water-level. So far as could be seen, the ore vein continues down very regularly, being from 1ft. to 2ft. in width. At the bottom, or below water-level, it was stated that the lode is from 2ft. 6in. to 3ft. thick. The ore dumps show the material to be associated with blue and green carbonates, and bunches of porous ironstone. At 50ft. from surface a small cross-cut was driven in the hanging-wall side from 8ft. to 10ft., the country rock being soft clayslate, with splashes and nodules of chiefly green carbonates, which doubtless have filtered from the lode. Fifty feet further N. an open cut, 20ft. long by 10ft. deep, has exposed lode matter 2ft. wide, containing large blocks of green carbonates, associated with grey ore and iron gossan. About 150yds. N. of the open cut a shaft has been sunk to the depth of 70ft., the lode being well defined, ranging from 18in. to 3ft. in width, containing small veins and streaks of copper-bearing material; the country rock is also copper-stained for several feet in the hanging-wall side. The footwall up to the present has not been explored. The most N. workings on the line of lode are 6 chains still further N., and have been worked to the depth of 12ft., the formation being 2ft. wide, showing, in places, bunches of green carbonates. Towards the N. portion of the property an open cut, 25ft. long by 8ft. deep, has disclosed a strong ironstone formation considerably W. of the main lode, from 2ft. to 4ft. wide, showing here and there blue and green carbonate stains. Sorted samples gave, it was stated, a return of 5 per cent. copper. The same formation is exposed at the S. end of the property, but little has been done to prove its value. A little over 5 chains E. of the main lode a second ironstone formation is exposed, about 4ft. wide, apparently underlying W., and will, from present appearances, junction in a reasonable depth with the main lode or copper-bearing vein. To further prospect and develop this property it would be advisable to ascertain the proper underlie of the two formations, and then sink a main vertical shaft to intersect the lode at the point where the junction takes place, which would be some considerable depth below water-level. The prospect is a fair one, and the indications favorable. Up to the present there have been dispatched 10 tons of ore, which returned an average value of $23\frac{1}{2}$ per cent., and about 5 tons at grass of about equal value. (I.M.R., 29-5-00.)

REYNOLDS, HUNDRED OF, SEC. 1904.—About 15 miles from Hallett. A vein outcrop striking N. and S. can be traced for a considerable distance on the surface, and has been prospected for copper and gold by an open cut 20ft. long from 3ft. to 12ft. deep, and one shaft 15ft. deep. The vein is 2ft. 6in. wide near the surface, containing blue and green carbonates, which give place at the bottom, where the vein is contracted, to more siliceous material; the stone carries a little gold. Enclosing rock hard and difficult to work. Shaft should be continued for another 30ft., in order to test persistence and value of vein. Best assays obtained from samples taken were, copper 8 per cent., and gold 5dwts. (I.M.R., 12-5-04.)

REYNOLDS, HUNDRED OF, SEC. 183.—An opening 15ft. long and 5ft. deep has been made on a vein formation striking N. and S.; it is about 2ft. 6in. wide, and is composed chiefly of siliceous matter, containing, near the surface, blue and green carbonates, strongly associated with red oxide of iron; it also carries a little gold, which at times can be seen in the stone. Towards the bottom the copper contents decrease, and the indications for gold seem more favorable. An underlie shaft should be sunk to a depth of 50ft. in order to test approximate quantity and value of contained metal. Two samples taken from the open cut assayed—No. 1, small parcel, 4dwts. gold, 1 per cent. copper; No. 2, large parcel, 1dwt. gold, 18 per cent. copper. (I.M.R., 12-5-04.)

RED OXIDE.—Situated about 3 miles S.W. of Mount Lyndhurst Mine. One shaft has been sunk to the depth of 16ft. on the footwall of a lode composed of ferruginous matter, containing small seams of red oxide of copper and grey ore, giving an average of 8 per cent. Very little work has been done, and the ground should be tested at the deeper levels. (I.M.R., 4-8-99.)

ROBINSON'S.—Situated about 23 miles N. of Port Augusta. The lode outcrop, which strikes N.E., can be traced for a considerable distance on the side of a hill, which stands at an elevation of 200ft. above the level of the plain. A shaft has been sunk on the underlie, 45° E., for about 40ft., disclosing the lode formation from 8ft. to 10ft. wide, containing green carbonate, so far of very low grade, which, being impregnated all through the matrix, is difficult to dress or sort to a fair grade. Towards the bottom the lode has a steeper dip, and may possibly improve in value; this can only be ascertained by sinking the shaft deeper. About 400ft. N. of the shaft the hill dips very abruptly, and the outcrop is well defined, showing green carbonate and small spots of grey ore. No work has been done here, and it would be advisable to drive a tunnel S. on the course of the lode, keeping on the hanging-wall side, which apparently contains the best ore; this would leave about 100ft. of backs, and if proved payable, a second tunnel could be driven, almost at the creek level, for working the deeper ground. Sample from bottom of shaft assayed 4 per cent., one from 20ft. from bottom, 2 per cent., and one from the proposed tunnel site gave 11½ per cent., which is very encouraging. (I.M.R., 19-12-99.)

REACHEL LEASE.—Section 187, hundred of Hawker, about 12 miles W. of Franklin Harbor. The work done consists of two small trial pits, 4ft. and 8ft. deep; the latter has exposed about 4ft. wide of lode material, in places containing green carbonate of copper, assaying 6½ per cent. This is considered very encouraging, and prospecting at a depth is recommended. (I.M.R., 14-9-99.)

RICHARDSON'S W. CLAIM, IRONSTONE LAGOON.—About ½ a mile S.W. from the Sweet Nell, on the E. side of a small creek running N. and S., there are exposed small veins of green carbonate dipping into the hill at a flat angle. From surface workings Mr. Richardson obtained a ton of 13 per cent. ore, and the ground should be further prospected. (D.R. (Gee), 18-7-06.)

ROYAL MINING COMPANY OF SOUTH AUSTRALIA.—This company purchased 720 acres of land, chiefly in the neighborhood of Kapunda, at a cost of £1,500, but no important discoveries were made. (December, 1846.) Amalgamated with the Emu Flats Association, June, 1850.

RYAN'S COPPER CLAIM.—The Inspector of Mines visited this claim, situated in the hundred of Uroonda, in 1889, and states that two small shafts had been sunk on the underlie of a copper lode, which dips at an angle of 30°, the size of the branch varying from 4in. to 12in. It is enclosed in talcose schist, and would be inexpensive to work. The ore went up to 45 per cent., and the mine looked very promising.

SALTIA COPPER AND COAL MINE.—Situated about 1 mile N.W. from Saltia Railway Station. The Inspector of Mines reported in 1892: Shallow shafts and trenches sunk in a small crystalline limestone vein copper-stained, which is enclosed in argillaceous slates. Of no value. A pit was sunk 12ft. on a small flucon vein, where coal was alleged to have been discovered. The Inspector reported very unfavorably of the whole affair, as being worthless.

SCHMIDT'S MINE.—Situated near Mattawarangala Creek and 2 miles E. from the well. The cap of a quartz lode containing copper has been removed by means of an open cut, a drive, and a shaft 12ft. deep. The lode varies from 2ft. to 3ft. 6in. wide, and contains low-percentage copper ore. The dip of the lode is very slight, making this an easy venture to prospect below the present excavations. This the Government Geologist considers would be worth doing. (February, 1899.)

SCOTT'S CREEK (Cherry Gardens).—Situated about 18 miles from Adelaide, on the side of a steep but not very high hill, on the surface of which, in ironstone rock, some strong stains of copper were found, and a shaft was sunk. The ore was chiefly grey oxide, mixed with a little green and blue carbonate. The lode was small, but regular and well defined; at the depth of 5 fathoms there was but little ore, the lode being chiefly composed of gossan. The lode is nearly a downright one, having but little underlie. (Austin, 1863.)

SIR DOMINICK MINE.—This property adjoins the Daly Mine, about $5\frac{1}{2}$ miles E.N.E. from the Yudnamutana Mine. The range rises to a height of 400ft., and its crest consists of an immense rugged mass of ferruginous, highly fractured quartzite, forming a nearly perpendicular wall of over 100ft. in thickness, with larger and smaller bulges from 50ft. to 70ft. in height. This mass runs from its most N. and highest point first E. 35° S. for a length of 16 chains; here it turns due E. for about 9 chains and makes then, whilst gradually decreasing in height, a sharp turn in a flat curve due N. for another 10 chains, where it abruptly terminates in a bold bluff close to the creek. Nearly all throughout the first portion of 16 chains it shows not only abundant copper stains and coatings in joints and hollows, but contains also numerous larger and smaller pockets, filled with a white, arenaceous clay, thickly copper-stained, and sometimes enclosing small, solid nodules of malachite and azurite, which, on being broken, exhibit occasionally red oxide of copper in the centre. Similar nodules occur also thinly scattered through the surface detritus, at the base of the mass. There exists besides, in this portion of the quartzite wall, a number of small caves, some quite empty, but others partially filled with similar clay and copper ore as the above pockets—a fact which clearly indicates that all represent pockets from which the cupriferous clay has either wholly or partially been removed by denudation. On account of this mode of occurrence of copper ore in it, and also because it appears to lie within the strike of the rocks, this portion of the quartzite mass bears a strong resemblance to the quartzite layer of the Daly Mine; and, although the ore contents of the pockets, as exhibited on the surface, are not as rich as in the latter, still there exists some likelihood of improvement towards the centre of the mass. Proper prospecting of the latter might not go unrewarded. The other portion of this immense outcrop, which curves across the strike of the country, shows hardly any copper stains, and apparently represents a silicified zone in the rocks, as the lines of stratification of the latter are, in places, traceable right through it. Rugged massive protrusions, consisting most probably also of quartzite, are visible on nearly every one of the bare precipitous mountains rising towards the S. and W.; and in the creek, S. beyond the quartzite wall, lie blocks of pure micaceous iron ore, some of tons in weight; and, at one place, there is an outcrop of a fine lode of this ore from 4ft. to 5ft. in thickness. The rocks generally are of metamorphic character, presenting mica-schist, hornblende-schist, satiny and spotted slates—the same varieties as observed near the Yudnamutana Mines; and, as pebbles of hornblende rock are occasionally seen in the creeks, there can be no doubt that this rock occurs likewise here and there, in small bosses or dykes, and lies, perhaps, in mass pretty close beneath the surface. (Ulrich, 1872.)

In 1890 the Inspector of Mines reported upon this property, mentioning that it had been worked 14 years previously. He noted small veins and nodules of blue and green carbonate of copper running through and intermingled with soft rock. A considerable amount of useless work had been done, as, for example, a tunnel driven 142ft. about 40ft. below the crown of the hill. This tunnel cut through a formation fully 60ft. wide. A shaft has been holed into the tunnel at 60ft. Carbonate of copper in small quantity runs through the whole width of the lode. A shaft was sunk 50ft. W. on the hanging-wall of a parallel lode. Lower down the hill another tunnel was driven 155ft. In the opinion of the Inspector this should have been continued, as the property is a good one, wanting capital for development.

Later reports show that, so far, very little further work has been done at this place.

SLATY ROCK MINE.—Locality, section 35, Cudlamudla. A calcespar lode, containing an appreciable percentage of grey copper ore and carbonate, with occasionally red oxide, strikes N. 42° W. for 500ft., the thickness of the lode varying from a few inches to 5ft. The deepest shaft is 33ft., and passed through 3ft. 6in. of lode. There is a good prospect of payable copper being found by following down the shoots of ore. (Government Geologist, 1899.)

SLIDING ROCK MINE.—Situating 14 miles from Beltana Railway Station, on the S. side of Sliding Rock Creek, at the base of a hill of medium height, composed of hard limestone. The main ore deposit is a lode varying from 18in. to 10ft. wide. Its course is tortuous, and has a mean strike of N. 20° E., and with an E. underlie of 3ft. in the fathom. It traverses the beds of the country, which strike W. 20° N., and dip S. at an angle of about 60°. The walls, which are fairly well defined, consist on the E. side of a blackish aluminous shale, resting against a hard bar or reef of impure brown iron ore; and on the W. one of soft sandy concretionary light-colored shale, which near the surface is more or less thickly stained with blue and green carbonate of copper and brown iron ore. The existence of the ironstone reef in the E. wall is of great value to the mine, for the reason that it dams back a seemingly great accumulation of water in the rocks behind. At the surface the ore consists of rather earthy and not very rich-looking carbonates; but it changes in depth to an association of red oxide of copper, native copper, green and some blue carbonates, in a soft, clayey, partly ferruginous matrix. The red oxide occurs frequently in large crystalline, granular, and vein-like masses; the native copper in pure crystallised masses, occasionally several cubic inches in size; and the carbonate—mostly malachite—forms veins and druses in connection with the former. Beneath the water-level traces only have as yet been discovered of black sulphide of copper ore. About the middle of the length of lode opened, the latter is traversed, without being faulted, by a crosscourse of 13ft. in width, and striking W. 17° N. This crosscourse carries ore similar to that of the main lode, and has been followed for several fathoms towards the W. The limestone, of which the hill is composed, is greyish-black, micro-crystalline, hard and tough, and, according to chemical analysis, contains a large percentage of magnesia, some silica, and carbonaceous matter. (Ulrich, 1872.)

In November, 1899, the Inspector of Mines furnished the following report:—The main lode, which varies in size from 2ft. to 10ft., is very erratic in its course, apparently following the base of the hills, and has been traced for a considerable distance, the outcrops in places exposing more or less blue and green carbonates; the strike is N. 20° E., with an E. underlie of 2 in 6. The W. wall is fairly well defined, and near the surface is composed of soft friable material, stained with green carbonates and iron. On the W. side, and towards the N. end of the outcrop, there is a large ferruginous clay lode deposit, exceedingly tenacious, and containing copper in the various forms of red oxide, carbonates, malachite, and native copper crystallised in veins and bunches throughout the matrix. The enclosing rock is chiefly hard crystalline limestone, which crops strongly above the surface at various points. The clay deposit has been worked by shafts and an open cut. The deepest, or main shaft, has been sunk to the depth of 210ft., levels driven to various lengths at 90ft. 150ft., and 200ft., and the ground stopped from 150ft. to the surface. It was stated that the bottom level was still intact, the lode formation having the same appearance as above, and containing high-grade copper. The open cut, which has been worked in the clay formation or deposit, is about 100ft. long, 60ft. wide, and 30ft. deep. The face exposes a large quantity of material, containing copper of various kinds, chiefly carbonates, which should pay for concentration, and as work is continued other rich ore bodies may be reasonably expected. The inspector was informed that the mine commenced vigorous work in 1871, and suspended operations in 1876. The returns during that time show that about £100,000 worth of copper had been raised and disposed of; a large proportion of it was in the form of native

copper. The reason given for the suspension of operations was the large influx of water, in connection with the soft friable lode matter, and the need of appliances to cope with it. At the time of the inspector's visit (November, 1899) the mine was being restarted. A main shaft, 14ft. by 6ft. in the clear, was in progress; a double-cylinder pumping engine and the necessary pumping appliances, with 18½in. diameter pumps, and a large double-cylinder winding engine, with poppet heads 60ft. high, were to be erected, also a small steam winch, to enable sinking to be continued during the erection of the larger machinery. The mine is regarded as a legitimate mining venture, and this machinery, when completed, should enable it to be reopened and thoroughly developed. (I.M.R., 7-11-99.)

In March, 1901, the inspector further reports that, since his last visit, a large pumping engine, winding plant, and other appliances have been erected. The main shaft has reached a depth of 361ft., substantially timbered, centred in three compartments, and ladder-road fixed from top to bottom. At the 310ft. level a chamber has been opened, and a crosscut, which is apparently crossing the lode in a diagonal direction, has been made for 87ft., being in lode matter the full length; this, if continued, will be 130ft. below the old workings. The lode material is of a very unusual character, being composed of fine-grained argillaceous sandstone, containing native copper, which occurs in fine grains, thin streaks, and at times in more massive form. Eight bulk samples from various points of the crosscut along its entire length assayed from 1 per cent. to 2½ per cent. copper; the samples were taken roughly in bulk, and when examined prior to assay no metal could be seen, and no doubt, with a moderate judicious sorting of the material as raised, which is always necessary when dealing with such large ore bodies, much higher results would be obtained. The material is friable, and when thoroughly drained from water will be inexpensive to work; it is a very favorable combination for treatment or concentration, and when the drive reaches the point under the old workings more massive native copper will doubtless be encountered. (I.M.R., 29-3-01.)

In continuing the crosscut a large body of water was struck, and the mine flooded before the pump was placed in position. Operations were then suspended.

In 1906 the property was taken over by the Tasmanian Copper Company.

A report in August, 1907, states—The principal work carried on at present is at the new shaft, which is about 3 chains N.E. from the old workings. The shaft is equipped with up-to-date machinery, viz., one pair of 12in. first-motion winding engines, one Cornish lift 18in. in column (capacity 30,000galls. per hour), one steam pump (placed in the shaft to be used when there is anything required to be done to the lift). Steam for pump and engines is supplied from two Cornish boilers. The only work carried on in the shaft is driving W. at 235ft. level for the purpose of tapping the old workings, which are full of water to within 54ft. of the surface. This is a critical undertaking, but with the care taken at present by the management I think it will be a success. The drive is in 72ft., and is well timbered with 10in. insets, with 3in. thick laths on top, bottom, and both sides. Three bore holes of from 25ft. to 30ft. long and 2in. in diameter are kept in advance of the drive for safety. There are 40 men employed on the mine, and most probably, when the water is out of the old workings, as many more men will be required. (I.M.R. (Jones), 22-8-07.)

SCOTT'S CLAIMS.—Situated 1 mile E. of Mount Coffin. Prospecting has been done by a number of surface openings, which expose lode material containing green carbonates of rather low grade; there is also an ironstone formation, unworked, the outcrops of which show green carbonate and a little malachite. In another part of the property there is a strong ironstone outcrop 5ft. wide, containing copper of various kinds; no work has been done on it beyond an opening 4ft. deep. The prospects are encouraging, and the ground should be tested by the sinking of trial shafts at the points where the copper-bearing material is most freely exposed on the surface. (I.M.R., 21-1-00.)

SIMMONS' CLAIM.—Situated about 1 mile N. 30° E. from Boolooroo Gold Diggings. A vertical shaft has been sunk 60ft. on a vein of clean copper glance, which varies from lin. to 6in. in thickness. It strikes N. 35° W. and dips vertically. About 70ft. S.W. from this shaft another shaft has been sunk 30ft., and at the bottom a drive S.E. was in progress. The country rocks are clay slate. (George, 27-8-02.)

STONE'S CLAIM.—Situated about 1 mile S.E. from Dépôt Springs. An inclined pit, 20ft. deep, and about 8ft. wide, with a trench at surface 20ft. long and 10ft. wide, discloses interstratified veins of specular iron which carry small bunches of copper glance and ferruginous copper ore. The veins strike N. 20° E., and underlie S.E. at an angle of about 25°. About 6½ tons of first-class copper ore was obtained from these workings; the veins are small. N.W. about 8 chains an irregular inclined tunnel has been driven on what appears to be an interstratified lode formation about 3ft. thick, which carries irregular veins and seams of siliceous ironstone with bunches of grey copper ore, ferruginous ore, and a little cuprite. A shaft has been sunk 35ft., and various shallow pits and costeans made. Nothing of importance disclosed. (George, 27-8-02.)

THE SOUTH AUSTRALIAN COPPER CORPORATION.—A later development of *The Associated Copper Trust* (vide page 146) was formed in 1900, and comprised an amalgamation of various properties near Leigh Creek, viz., Cutaway, Mountain of Light, O'Donnell's claims, Holmes' claims, and some undeveloped adjoining claims. Extensive machinery was erected, but, for various technical reasons, the efforts of the corporation to economically concentrate the local copper-bearing material were not successful, and in 1903 the property was taken over by Mr. C. H. Hakendorf, who removed the bulk of the machinery, and formed part of the properties into a syndicate called the O'Loughlin Syndicate. Information concerning the properties in detail is given herewith, from the reports of the Inspector of Mines, of various dates. (Taken over by Tasmanian Copper Co., and smelter in course of erection, 1907.)

The Mountain of Light.—Situated 2 miles S E. from Leigh Creek. The property was being worked by two shafts, 100ft. apart, each sunk to 70ft., water-level. The lode formation has been worked on the surface by open cutting, and is from 8ft. to 10ft. wide, making larger in depth. At the 70ft. level, crosscuts, drives, and stopes are being worked in a wide body of lode matter, composed of soft clay slate and kaolinised material, containing seams, veins, and nodules of good ore, chiefly in patches, and in the form of green carbonates and small pockets of black oxide, associated with iron. The lode matter is very suitable for concentration. From time to time a considerable quantity of 20 per cent. ore has been sent away. To work the property to advantage, a main shaft should be sunk, and proper appliances obtained to cope with the quantity of water which will doubtless be met with at the 100ft. level, and which will be of great assistance in the ore-dressing. The property is a large one, and the prospects very fair for future development. (I.M.R., 16-11-99.)

The Cutaway Mine.—Situated about 2 miles S.E. from Leigh Creek. Towards the N. end an open cut has been made about 50ft. long and 15ft. deep. This exposes the lode formation from 12ft. to 14ft. wide, containing green carbonates, in bulk of very low grade, but capable of being dressed by hand-sorting up to 8 per cent. or 9 per cent., and by machinery to a much higher standard. The country rock is principally clay slate, with sandstone ridges, and in places there are ironstone outcrops, on which little or no work had been done, and their value therefore not ascertained. Towards the S. end, adjoining the Mountain of Light, the formation is smaller, averaging about 3ft. wide, the strike being N.E., with an E. underlie. It has been worked for fully 100yds. long, by open cutting and a series of small shafts, to a depth of 50ft. The lode material is a soft friable matter, enclosed in good walls, and containing seams and veins of copper ore, chiefly green carbonates. The stuff as raised gave an average value of 5 per cent.; there was then being dispatched a little over 20 tons per week to the concentrating plant, where it is dressed to from 18 per cent. to 25 per cent., still leaving about 3 per

cent. in the tailings; this loss could be avoided by proper dressing appliances. For future development a good main shaft should be sunk to the E. of the present workings; this would probably intersect other veins of ore, and also provide water for working the mine. (I.M.R., 15-11-99.)

On a second examination, made in June, 1900, the Inspector of Mines reports that the main shaft is down to the depth of 110ft. on the lode underlie, which is water-level. The lode at the bottom is the full width of the shaft, and carries from 3 per cent. to 5 per cent. of copper. At the 80ft. level there is a brown iron-stained seam from 2ft. to 5ft. wide, with small seams, veins, and nodules of green carbonate and red oxide; this seems to be the main lode formation, and bears E. and W. From it crosscuts have been driven N. and S. for a distance of 100ft., 80ft. of which is through soft decomposed slate, easily worked, and in places showing copper streaks and bunches. At the same level (80ft.), drives have been extended on the course of the lode for a distance of 350ft., all showing the same class of material, and probably of similar value. The property is being worked by a company, in conjunction with Holmes' and O'Donnell's claims. (I.M.R., 29-6-00.)

O'Donnell's Claims.—Situated about 1 mile S.E. from Leigh Creek. The workings consist of a large number of surface openings and shallow shafts sunk on the line of lode or ore deposit; these have exposed copper-bearing material about 60ft. wide, chiefly green carbonates, with a little grey ore. The strike is N. and S., with various cross veins, from 1ft. to 3ft. wide, intersecting the main formation. A parcel of ore recently dispatched returned 7 per cent., and other parcels of dressed ore gave an average value of 14 per cent. The lode matter is overlain with loose kaolinised material to the depth of from 2ft. to 5ft. The lode capping is apparently hard, solid, and well defined; as so little work was done, its exact width or extent could not be determined, but, from surface appearances, the ore body is judged to be very large. About 90yds. E. of the lode formation a fair-sized shaft was being sunk, partly to supply the mine with water, and also to crosscut for the lode at various depths. The surface was also being removed from the lode capping, preparatory to the mine being worked by the open-cut system, and machinery erected. (I.M.R., 15-11-99.)

The Inspector of Mines, after revisiting the property in June, 1900, reports that a main shaft, 10½ft. by 4ft. in the clear, had been sunk to 112ft.; this it was anticipated would pass through the lode in another 500ft. A little above the 100ft. level a crosscut W. was in progress, then in 140ft. from the shaft; it was expected to intersect the lode in another 60ft. Foundations for a winding engine were being constructed, and it was intended to erect a large ore-dressing plant, of sufficient capacity to deal with the Cutaway, Holmes', and these blocks, which were all then held by the one company. (I.M.R., 2-7-00.)

Holmes' Claim.—Situated 2½ miles S.E. of Leigh Creek, adjoining the Mountain of Light on the S. A soft sandstone and clay slate ridge is impregnated with carbonate of copper, in the form of small nodules, but no work had been done to test its value. N. of this two shafts have been sunk to the depths of 17ft. and 33ft., but nothing of importance struck in either. It is a fair venture, and worth prospecting, and should be developed in that portion where the green carbonate shows most freely on the surface. (I.M.R., 12-1-00.)

The Inspector of Mines, revisiting in June, 1900, says that an open cut has been made through the formation, showing it to be fully 70ft. wide, the ore-bearing veins being on the foot and hanging walls, one showing splashes and veins of green carbonate and grey ore for over 15ft. in width, and the other from 2ft. to 3ft. wide, containing in places ore of very fair value. The central part of the formation is almost barren; the depth of the cutting is 20ft., and the width at the top 30ft. A large quantity of ore had been raised for treatment. Held by a company, in conjunction with O'Donnell's claims and the Cutaway. (I.M.R., 2-7-00.)

South Australian Copper Corporation.—In November, 1900, the Inspector of Mines reports :—The property consists of a number of mineral holdings situated from 1 mile to 2 miles E. of Leigh Creek. On O'Donnell's block a main shaft, 10ft. 6in. by 4ft., has been sunk to water-level, 112ft., and at this point a crosscut towards the lode formation, a distance of about 100ft., was in progress, when, owing to the strong influx of water, all underground work was discontinued, and operations confined to the erection of the complete and extensive plant of machinery now in progress, and expected to be in working order by the end of next January. The work of development at the Cutaway block is being continued by driving on the course of the lode at the 96ft. level, there being now fully 700ft. of driving from face to face. The material is the usual kaolinised gritty matter, containing blue and green carbonates, of fair value, occurring in streaks and bunches, also grey ore and red oxide. A main shaft, now 70ft., is being sunk, and machinery erected for winding purposes, some considerable distance W. of the main workings; it is intended to carry this down to a depth sufficient to drain the various levels. The work in Holmes' block is continued by an open cutting, from 12ft. to 14ft. wide, the matrix being a coarse gritty sandstone, with veins and splashes of good green carbonate ore throughout. A tunnel was also in progress, now in 43ft., and as the country rock at that point is copper-stained, the copper-bearing formation is doubtless near. (I.M.R., 6-11-00.)

O'Loughlin Syndicate.—This property comprises the Mountain of Light, Cutaway South, and three other blocks, the whole being a portion of the land previously held by the Copper Corporation, and has been recently acquired by this syndicate. Twenty-three men are employed, and the syndicate has forwarded to market over 200 tons of 20 per cent. copper ore. Present operations are confined principally to driving, and stoping ore from the 60ft. level upwards. The workings have disclosed an enormous formation, both in width and length, of kaolinised gritty matter, containing more or less green carbonates all through, at times occurring in bands or streaks and other large bunches of high-class ore, in nodular form. In the lower portions of the workings, near water-level, some of the stopes and winzes have exposed veins of black ore, from a few inches to 4ft. thick, copper contents ranging from 5 per cent. to 14 per cent. To cut the formation at depth a main shaft was sunk by the Copper Corporation 147ft., and a crosscut driven towards the formation for 107ft., the last 20ft. being in low-grade vein matter; the footwall of the formation had not been reached when work was suspended, and therefore its width and value at that point had not been ascertained. This crosscut should be resumed until through the copper-bearing matter, then, at the most favorable points, drives made each way on its course; also the sinking of the main shaft should be continued, as the formation would probably be intersected in another 100ft. (I.M.R., 15-2-04.)

SOUTH CREEK COPPER MINE (first opened in the early eighties).—Situated about 4 miles N. from the Burr Well, on a large creek. It has been worked on three lodes. Two of these to the S. are parallel lodes 3ft. apart, in a calcite reef, with well-defined walls. These dip 82° S., and are easily traced for some distance on the surface. The ore in this lode consists of green carbonates in kaolinised slate. It was worked to about 70ft., when the water-level was struck, and operations were discontinued.

An official report in January, 1905, states that the mine was being reworked by the original holder. The lode matter exposed in the old workings consists of kaolinised and ferruginous argillaceous material, fairly rich in prills of green carbonate. It strikes N. 20° E., and underlies W. at from 15° to 20°. An inclined tunnel was driven, following the underlie of the lode for a distance of 90ft., and the ore stoped out on each side to surface for a total length of about 3 chains, and varying up to 4ft. in thickness. At 120ft. W. from the tunnel a vertical shaft has been recently sunk to a depth of 47ft., where it met with the lode matter; a drive was made N. 60° E. for 45ft. to connect with the stopes worked from the tunnel. The lode here is ill-defined, and consists of argillaceous and ferruginous matter carrying green

carbonate and a little impure black oxide, occurring in small bunches connected by seams of ferruginous matter. At about 7 chains N.E. from these workings a pit, 10ft. deep, discloses a lode of quartz and ferruginous calcite which contains bunches of copper carbonates, oxidising copper, sulphides, and ferruginous copper ore; it strikes N. 10° E., and underlies W. at an angle of 40° ; the full thickness of the lode is not disclosed, but it shows in the pit $4\frac{1}{2}$ ft. About $\frac{1}{2}$ mile N.W. from these workings, and on the bank of South Creek, several nearly vertical veins of calcite strike E. and W., cutting through beds of clay and calcareous slates. On two of these veins shafts have been sunk to depths of 20ft. and 73ft.; water occurs in the latter at 35ft. from surface. The calcite contains bunches of ferruginous copper ore, copper and iron pyrites, and copper carbonate with gossan in the vughs; the veins are persistent in strike, and vary in thickness from 2ft. 4in. to 3ft. A little ore had been raised and dressed to 20 per cent. (George, 26-1-05.)

The operations continue, and returns to the end of June, 1907, are satisfactory.

SWEET NELL MINE.—Situated on the N. portion of Ironstone Lagoon, $1\frac{1}{2}$ miles from the Monalea tank, and about 72 miles from Port Augusta. The workings are along the W. edge of a N. and S. peninsula jutting into the Lagoon and about 10 chains wide, the surface being about 15ft. above the bed of the lagoon. A shaft sunk about the middle and near the S. end passed through rubble for 3ft., then 6ft. of solid dolomite, succeeded by a 3ft. bed of soft argillaceous gypseous material, in which the copper ore occurs; below this the shaft was continued for 32ft., making 47ft. in all, through dark-red sandstone—the country rock of the district—which outcrops in various places near the edge of the lagoon. Drives, or tunnels, made from the W. side form numerous galleries in the formation under the dolomite, extending for about 230ft. E.; the dolomite bed seems to have a slight dip towards the N.E. The copper ore is mainly green carbonate in pockets, seams, and strings for about a foot in thickness along the top of the soft argillaceous bed; it is also, in places, attached to the dolomite roof, and can be seen almost everywhere throughout the drives. In a drive from the S. end the band containing the copper is 16in. below the roof and is 1ft. thick. On the E. side copper also shows in various openings made, but not much work has been done here so far, operations having been mainly concentrated on the W. side. About 20 chains from the workings N. along the W. side a drive has been made 150ft. E.; copper ore shows in small seams all the way, and the bottom of the drive is in soft purple slate. S. from this a pocket containing a few tons of rich ore was found in the bank, and further S. an ironstone and slate bed carrying copper ore has been prospected to a certain extent.

Average samples of the ore (a high-grade green carbonate, malachite) taken from along the drives assayed—No. 1, 23.9 per cent. copper; No. 2, 23.8 per cent.; 50 tons hand-dressed up to 30 per cent. have been sent to market.

At the S. end there seems a large area from which ore can be obtained without much difficulty by the present method of working, during which it is possible that a lode going down may be found, and at the N. end, where copper ore occurs in association with ironstone and slate, further prospecting is fully justified, and may lead to important results. (D.R. (Gee), 11-7-06.)

SIR JENKIN COLES'S PROPERTY.—Situated about $\frac{1}{2}$ mile E. of Kapunda. Previously worked about 20 years ago, by sinking a few shafts, now filled with debris; their depth could not be ascertained, nor to what extent work had been carried out, though, judging from the dump, probably very little. The present workings are confined to two openings on separate veins, about 40yds. apart. The N. vein is from 12in. to 18in. wide, the matrix being chiefly dense iron, with splashes of green and blue carbonate, of low grade in bulk, but, in consequence of its fluxing quality, should command the highest price per unit. On the S. vein there is an opening from 8ft. to 10ft. deep, disclosing a formation 15in. wide, containing blue and green carbonates associated with iron, but not to the same extent as the N. vein; it is of a more promising nature, and should be prospected by, in the first place, continuing the surface workings W., with the object of proving whether the vein increases

in size or junctions with a N. and S. lode, as possibly these veins may be offshoots from such a lode at present hidden by the alluvial; then, at the most favorable point, sink a small prospecting shaft on the underlie of the vein. The same system of prospecting should be adopted with the N. vein. Each has a fair prospect, worthy of a trial, and the copper raised would assist in the expense of development. The enclosing rock is slate of a favorable character, portions being highly stained with green carbonate. (I.M.R., 21-11-99.)

SIMMS AND BRADLEY'S.—Mineral claim 1433, situated 5 miles from Cleve, and 33 miles from Franklin Harbor. A strong ferruginous outcrop, from 4ft. to 8ft. wide, containing bunches of blue and green carbonates of copper, has been worked by an open cut to the depth of 15ft. On the W. side a shaft has been sunk 40ft., and a short crosscut driven E., passing through the lode formation, which at this point is chiefly composed of clay and fine quartz. From the open cut there have been raised and dispatched 22 tons of ore worth 10 per cent. copper. The character of the material is also favorable for gold, but a sample taken for that metal gave no results. (I.M.R., 14-9-99.)

SOUTH DEVON.—This mine, situated between the Duryea and the Doora, not far from the Wallaroo Mines, had two lodes, which were discovered by costeaning. A shaft was sunk on the S. lode to the depth of 22 fathoms, and a crosscut was driven to the parallel lode, which was from 2ft. to 3ft. wide and carried a little yellow ore. A good deal of work was done, but nothing has been heard of the mine since the depression in the price of copper occurred. (1899 edition.)

SOUTH DOORA.—Held by a prospecting syndicate, formed to search for a continuation of the Doora lode. It was reported that a large quantity of excellent copper was at one time raised from this mine.

S.E. DOORA.—A similar venture to the above. The claim contains a strong show of ironstone and gossan.

SOUTH KAPUNDA MINING COMPANY.—Established 1850, and its property was situated between the Kapunda and North Kapunda Mines. It appears to have stopped working in 1854.

SOUTH MOONTA.—This claim was about 2 miles S. from Moonta Mine, and the adventurers essayed the discovery in their three sections of the continuation of its lodes. They costeaned to a depth of 30ft., and in two places got very favorable indications. The small local company soon exhausted its capital and operations ceased.

SPRING CREEK MINE.—Situating 35 miles from Port Augusta and 11 miles N. from Melrose, on the N. flank of Mount Remarkable. A small drive of about 2 fathoms has been made about 120ft. above the level of the creek, into the hill, and shows several veins of red oxide from lin. to 6in. in thickness. A reef of rocks running up the face of the hill contains numerous stains of copper. On breaking off pieces of rock where these stains occur, ore is almost invariably found; in some cases blue and green carbonates, but more frequently red oxide and ruby ore, and sometimes a little native copper. (Austin, 1863.)

Located about 6 miles from Wilmington, on the bank of Spring Creek. Lode croppings can be traced for a considerable distance running diagonally across a line of high irregular hills, bordering the watercourse. One portion is of considerable width, showing copper stains freely, and, where broken, good copper ore, principally as blue and green carbonates and red oxide, can be seen. The chief workings consist of a tunnel and a main shaft; the former has been driven from the foot of the hill and intersects the lode, 6ft. wide, beneath the widest portion of the outcrop. Veins of ore branch off in various directions, and a number of irregular drives have been made on them from the tunnel, and also stopes have been worked from that level towards the surface. The ore apparently occurred in shoots and bunches, and consisted of green carbonates, grey ore, and red oxide, strongly associated with iron. A winze was being sunk below the tunnel-level on a strong body of ore over 6ft. wide. Three bulk samples gave 4½ per

cent., $5\frac{1}{2}$ per cent., and $6\frac{1}{4}$ per cent. copper per ton respectively, with traces of gold. Several other places on the mine show branches and portions of ore body that would pay to extract by contract, and doubtless others will be discovered. It was stated that the main shaft had been sunk to a depth of 132ft., and at the bottom a crosscut towards the lode driven for 30ft., and, as the pumping appliances were unable to cope with the influx of water, work was discontinued. This was in 1874. Little or no work has been done since, and in consequence of the water in the mine detail examination could not be made. (I.M.R., 15-11-01.)

Situated on Spring Creek, about 7 miles S. from Wilmington. This mine was originally opened in the early days, when a considerable amount of copper ore was raised, and a smelter was erected on the Melrose Road, a few miles to the E. Unfortunately, however, no records concerning the smelting operations are now available. A tunnel was driven in from the W. side of the hill, from which by drives and stopes a considerable amount of ore was worked; and a main shaft was sunk about 140ft. deep. The influx of water proved too great for the then holders. Work was abandoned in 1874, and since that time very little has been done. The valley to the W. of the mine, on the course of Spring Creek, was formerly occupied by a swamp; but about 10 years ago a flood cut a large channel through it, with the result that the country became better drained, and it is stated that the water level in the shaft fell 20ft. Work is now in progress between the old water level and the present one.

The property is now held by a Wilmington syndicate, and at about 150ft. along the tunnel a winze has been sunk about 20ft. on a large ore body which appears to strike N.E. and S.W. and dip S.E. This has been driven on for 40ft. S.W., and is 5ft. 6in. wide at the N.E. end (bottom of winze), and at the S.W. end it shows 15ft. wide, but the wall on the W. side has not yet been reached. It consists of siliceous ironstone and ferruginous quartz, carrying in veins, seams, and pockets blue and green carbonate, red oxide, grey ore, &c. A general sample taken across the S.W. face assayed 8 per cent. copper, and one across the N.E. face 4.9 per cent. copper. Patches of native copper are found throughout, some of them being remarkable in size and beauty as specimens. The lower old workings are still unexplored, on account of the water. The country rocks are argillaceous slate and sandstone. The syndicate has already sent to market 70 tons of ore worth from 5 per cent. to 15 per cent. The present operations disclose a large quantity of similar ore available, which could be readily hand-dressed up to a much higher percentage.

The place appears to me to offer every encouragement for systematic and vigorous prospecting and development, as from the class of ores seen and the extent and persistent nature of the ore-carrying material above, there is every reason to anticipate that large and strong ore bodies will be found below water level, and the reopening and exploitation of this mine on economical and careful lines may be regarded as a very promising mining venture. (D.R. (Gee), 12-6-07.)

STAINBANK'S MINE.—This prospect is situated on private lands at Fifth Creek, and the ground is composed of clay, slate, and sandstone, traversed by numerous quartz and iron reefs. A tunnel driven into a hill 250ft. has intersected a small mullocky reef, from which samples give on assay gold, silver, and copper in small quantity. The mine is within an auriferous belt of country. (Inspector of Mines, 1889.) (*Vide* also FIFTH CREEK CENTRAL, page 54.)

STANLEY MINE.—This mine is situated 4 miles E. from Yudnamutana, and lies in a low hilly district or basin, surrounded by high ranges. The country consists of metamorphic slates and sandstones, which strike W. 15° to 20° N., and dip S. at angles varying from 60° to 85° . There are four separate lodes much resembling one another in mineral character. The one nearest the Daly Mine lies on a low range and crosses micaceous slate. It is from 2ft. to 4ft. thick, and at the surface is composed of gossan, beneath which succeeds slaty and clayey mullock, with argillaceous

veins, and also patches and veins of quartz and calcite. Judging from some specimens left on the surface, the ore seems to consist of concretionary lumps and irregular veins of malachite and azurite. Some of the gossan ore, on chemical examination, showed very faint traces of bismuth. The length of the vein appears from the workings to be only about one and a half chains, its strike N. 30° W., and its underlie W. 30° S., at an angle of 55° . The walls are not well defined. About the centre of its length it makes a sharp turn W. 30° N. for about 6ft. The workings are—a deep underlie shaft communicating with a vertical one sunk to the depth of 30ft., where it strikes the underlie of the lode. Another vertical shaft, about 50ft. deep, lies in a gully in the line of the strike of the lode, and about 5 chains N. of the underlie shaft, but neither traces of lode stone, nor even copper stains, are observable in the spoil heaps around it. The second lode lies about 12 chains E. of the first one. The ore occurring in depth consists of brown iron ore, enclosing patches of copper pyrites, iron pyrites, malachite, and azurite. The workings consist of a short trench and an underlie shaft apparently 55ft. deep. Judging from these the ore seems only to extend for about 15ft. in strike. The strike of the lode is W. 30° N., and it dips S. 30° W. at an angle of about 65° . Its hanging-wall is well defined, and is represented by a strong reef of quartzite. The footwall is less regular, and consists of micaceous slate. The third lode lies about 11 chains S.E. of the foregoing one, and much higher up the range. The ore enclosed in the outcrop is of a far superior quality to that of the others, consisting of veins and solid lumps of malachite, azurite, and tile ore, embedded in cupriferous brown iron ore. Both the carbonates appear also frequently crystallised in cavities. The presence of bismuth ore could only be detected by chemical examination. Traces only of it could be found, notwithstanding that it had been reported to have occurred in large quantities. The workings consist of underlie shafts—one apparently 60ft. in depth—and shallow excavations on either side. In a distance of not more than $1\frac{1}{2}$ chains the lode showed great irregularity of strike and dip; the former being in the mean W. 15° N.; the latter, according to the main underlie shaft, 80° ; in a shallow excavation on E. end, about 45° S. The thickness of the lode varies from 2ft. in the W. to above 8ft. in the E. workings. The fourth lode is similar in character to the third lode. Its features, more especially conformity in strike and dip, indicate that it and the foregoing ones are “makes” of the same great lode, the fissure of which is closed, or perhaps only indistinct on the surface between. The workings comprise a small excavation on E. side, and close to the gully, and a tunnel of about 1 chain in length driven into the hill opposite. At the opening of the tunnel there is a rugged protrusion of quartzite, traversed by quartz veins. (Ulrich, 1872.) The Inspector of Mines examined this mine in October, 1890, and reported that it had not been worked since 1874. Several old shafts had been sunk on the course of the lode, which strikes E. and W., one to a depth of 80ft., and a considerable quantity of copper must have been obtained. The N. shaft is down 60ft., where the lode is about 4ft. wide, carrying a small quantity of blue and green carbonates. The matrix of the lode is calcite and soft clayey slate, with jumbled veins of iron-stone and quartz. On the N. line of lode a shaft had been put down 72ft., and close to it a shaft had been driven 80ft. into a low hill, and the lode had been stripped to the surface, evidently with a good yield of copper ore. Numerous lodes traverse the property, of a kindly nature, and 20 tons of bismuth raised from a depth of 40ft. on the S. lode realised £120 per ton. (1890.)

STRATHALBYN MINES.—Situate near the township. They were originally opened by private enterprise about the year 1848. Some good copper ore was raised and smelted on the property. They were subsequently sold to an English company, who made preparations apparently with the intention of carrying on operations on an extensive scale, but this they never did, and the copper lodes, for the working of which they originally purchased the property, have remained almost, if not entirely, untouched, the water not even having been pumped out. On another section a lode of silver-lead has been opened, and several hundred tons of ore sent to England.

In one place, about 18 fathoms below the surface, a splendid lode 18ft. wide of solid galena is exposed, and this lode having been traced for about 30 fathoms, it is estimated that fully 2,000 tons of ore can be taken out. The ore contains about 18½ per cent. of lead and 16½ozs. of silver to the ton. The shaft is sunk about 30 fathoms, and in the bottom the galena is improving, and it is also impregnated with yellow copper ore. (Austin, 1863.)

TASMANIAN COPPER COMPANY.—*Vide* BLINMAN, page 31.

TEATREE COPPER MINE.—The Inspector of Mines reported an examination of this property, situated 4 miles from Arrowie Station, in September, 1889. A fine outcrop of copper-stained ironstone can be traced for a mile on a course S. 20° E., dip E. 20°. A shaft was sunk 20ft. on a lode formation of 3ft., which carries low-grade ore. The cost of cartage and low price of copper make this a second-rate prospect.

TEROWIE (Ten miles S. of).—Claims held by Messrs. C. R. Goode and H. Price, about 1½ miles S. of the Wheal Issett Mine. The N. block shows for a considerable width a large belt of metal-bearing country, which has at various times been worked for copper. Two shafts have been sunk, 25ft. and 37ft., and a large number of surface openings and trial pits, extending fully 100yds. in width, in almost every instance disclosing small seams and veins of blue and green carbonates, with, in places, pockets of grey ore, principally calcareous. The vein-matter being small and the ground hard, work has been confined to surface and shallow levels, no prospecting at depth having been attempted. The S. block is apparently on the same level as the Wheal Issett. A shaft in progress had reached a depth of 22ft., exposing a stony iron gossan formation; two samples from which failed to disclose the presence of any metal. Towards the S. end of the block an opening 10ft. deep shows a similar formation 4ft. wide, apparently strong and well defined, but giving little or no indication of containing any metal beyond iron.

The N. block has the most favorable appearance for prospecting, there being numerous copper-bearing veins, which may improve in depth. (I.M.R., 21-7-06.)

TIDDY WIDDY.—This was the name of a venture not far from Ardrossan and the Parara Mine, Yorke Peninsula, which was regarded as having very good prospects. It was abandoned because of lack of capital. (1873.)

TRESEVEAN MINING COMPANY.—Held a lease from the Britannia Mining Company, at Bremer. Stopped working in 1851. In July, 1896, there was a brief resumption of work here on tribute, but no information has been received as to results.

TRURO MINE.—This property, situated about 6 miles from Kadina, in the neighborhood of the Cornwall Mine, was taken up as a prospecting venture, but was long ago abandoned, no results adequate to the outlay having been obtained. (1873.)

TUMBY MINE.—This mine is 8 or 9 miles N. from Tumby Bay, Spencer Gulf. The lode is 3ft. 6in. wide, and consists of blue and green carbonates, gossan, and spar. Two shafts were sunk, one to a depth of 9 fathoms and one to 7ft. Date of working, about 1867.

TRINITY.—About 2½ miles S. of the Mutooroo. It was originally prospected by H. C. Crocker, in 1887, and a shaft sunk to water-level, 130ft., where oxidised ore of good quality gave place to sulphide. The lode formation is about 6ft. wide, with a strike of S.E. and N.W. and a dip N.E. Since 1899 four shafts have been sunk, Wood's shaft (the deepest) being 168ft. on the underlie through carbonate and oxide ores to the bottom, where sulphide came in. This shaft is connected with Taylor's shaft of equal depth, and the ground between them stoped. Allanson's shaft is 68ft. deep. The ore from this shaft was mainly carbonate; and good ore was also obtained from Johnston's shaft, 90ft. deep. Stopping is now in progress, and a sample of the ore being raised, consisting of ferruginous quartz, malachite, and copper glance, assayed 27.3 per cent. For the past eight years the property has been worked by a local syndicate, and 457 tons of 19.62 per cent. ore sent to market. (D.R. (Gee), 2-7-07.)

TRINITY SOUTH (GERMAN HILL).—Three miles S. from Mutooroo. There are some shallow old workings here and a shaft in progress, now down about 20ft., in a formation consisting mainly of copper-stained quartz, the width of which is not yet clearly defined. It appears to strike E.N.E. and dip N. A general sample, composed of quartz, mica, and malachite, assayed 10.1 per cent. copper. (D.R. (Gee), 2-7-07.)

TRENOWDEN'S CLAIM.—Half a mile W. of Trinity Dam. There are a number of shallow old workings here, where small, non-persistent veins of carbonate have been "gouged," and a little of the same sort of work is now in progress. (D.R. (Gee), 2-7-07.)

TOWER HILL MINE.—This property lies between Tower Hill and the Avondale Mine, and is about 20 miles S.E. from Farina. The lode is 6in. to 8in. wide, with no defined walls. As it goes down it is improved in bulk by the addition of small leaders, and is dipping 30° to 56° E., whilst the rocks, which are calcareous slates, dip 75° N. The workings consist of an underlie shaft of about 60ft. in depth, and from there the lode has been followed by a drive for 40ft. without any apparent change. The ore consists of chalcocite, with stains of malachite, and a little chalcopyrite and atacamite. About 20ft. S. of the lode is a well-defined reef of calcite, with copper stains. It is probable that this will junction with the lode lower down, when it will assume a more definite character. (1884.)

TUNGKILLO.—*Vide* KITTICOOA, page 70.

UKAPARINGA.—In March, 1889, the Inspector of Mines reported on this property, which is situated about a mile and a half from Williamstown, and was first worked in 1850, under the name of the Wheal Friendship. He says that copper ore, raised in limited quantities, produced as high as 45 per cent., but the general bulk was of low quality. In later years it has been worked at different periods by parties of tributers, but is now idle. There are two lodes, one N. 10° E., the other N.E., with probability of conjunction at the S. end of the claim. An adit level cut the N. lode at a depth of 100ft., and it was proved by a winze to a further depth of 95ft. The lode formation is very poor in copper, but is bunchy, averaging not more than 4 per cent. ore, which could be dressed up to 35 per cent. In the bottom the bulk of the lode is white quartz, traversed by small veins of good ore. There is a large quantity of ground opened up ready for stoping. On the S. end of the claim a tunnel has been driven 200ft. hillwards, intersecting both lodes. In the end the N.E. lode is fully 12ft. wide, with regular, well-defined walls, carrying a fair percentage of yellow ore. There is, the Inspector says, some probability of gold being found in this mine.

ULOOLOO COPPER MINE.—Situated 3 miles E. from the Ulooloo Railway Station, in a mineralised belt of country bounded on the S. by a high range of granitic and gneissic rocks. The Inspector of Mines reported that creeks run E. from the range which give auriferous indications. A few feet S. of a strong outcrop of iron a vertical shaft has been sunk 108ft., and a crosscut thence intersected the iron lode, 18ft. thick. The country is congenial for stratified deposits of copper—in fact copper is distributed in slugs on the surface for 200ft., and the ground, composed of quartz, hornblende, feldspar, and carbonate of lime, has nodules of green and blue carbonates interspersed, besides here and there red oxide of copper. There are two other outcrops on the property, one of quartz and the other of iron, which have not yet been tested. The nature of the ground makes the work of exploration comparatively inexpensive. (1889.)

UMBERATANA.—The Inspector of Mines reported that this claim is on the mineralised range of hills that contain the Yudnamutana, Daly, Stanley, and Wheal Turner mines, and is situated about 3 miles N. of the latter. No work has been done, but there is a lode carrying carbonate of copper, which can be traced through the claims. (1889.) In 1890 the following information was the result of a later inspection:—A large outcrop of quartzite, very much fractured and disturbed, traverses a high hill, in which carbonate of copper can be seen from end to end. There is a parallel lode E., on which a shaft 30ft. deep had been sunk,

from which 6 tons of marketable ore had been raised. A tunnel driven down near the foot of the hill to intersect the two lodes would in all probability repay the outlay.

UROONDA COPPER MINE.—See RYAN's, page 125.

VESEY'S CLAIM.—This is situated about 10 or 12 miles N.E. from Nuccaleena. There is a well-defined lode running nearly through the section containing rich ore, green carbonate and grey oxide; and some of the latter is said to contain 70 per cent. of copper. The country consists of clayslate and pipeclay. But little work done. (Austin, 1863.)

VICTORY MINE.—Situated 17 miles E. from Leigh's Creek, on the top of a hill about 80ft. high, composed of quartzite, dipping to the S. The lode runs N. and S., and dips E. 68°; it is from 9in. to 4ft. in width; has a well-defined footwall, but no hanging-wall. The ore consists of chalcocite with malachite, atacamite, dark oxides, and sulphides. It runs in a shoot to the N. 45°, from 30ft. to 40ft. long and 20in. wide. The mine has been worked to a depth of 170ft. by an underlie shaft without striking water. The lode has twice pinched out and made again. Three shafts have been sunk, and drives to the extent of 100ft. made on the course of the lode. Three hundred tons of ore have been sent away during the last year or two, averaging, it is said, about 31 per cent. (1884.) The mine was not working in 1887. The Government Geologist reported the results of his examination at the latter end of 1896. He stated that this was an old mine, having been at work previously to 1884. The strike of the lode is from N. and S. to N. 10° W., with an underlie 70° to the E., cutting across the strike of the strata, which consists of quartzite, metamorphic sandstone, and indurated claystone. The lode is better defined at the lower levels than nearer the surface, but its width is small. Three men at the time of inspection were engaged getting out ore from portions of a lode which had been left unworked, and which was not very well defined. The shoot of ore is short, and it should be followed down and worked at a greater depth. Gossan from this mine on assay returned a trace of gold, and silver at the rate of 5ozs. 5dwts. per ton.

The Inspector of Mines reports concerning this property:—It has been worked by four shafts, extending for a distance of 5 chains in length, the deepest is 126ft., and shows the lode formation, which strikes a little to the W. of N., 10° to 13°, and underlies 70° to the N., to be from 2ft. to 4ft. in width, containing green carbonates and grey ore. The hanging-wall is good, but the footwall is very much broken. A considerable amount of driving and stoping has been done from the main level to the surface, and a large quantity of ore extracted. Below the main level a winze was in progress, the depth then being 26ft., and in the bottom the lode is fully 4ft. wide, containing splashes and bunches of ore all through. About the centre of the formation there is a vein of grey ore, apparently just making, being 9in. thick, and yielding from a sample taken 39 per cent. This is regarded as an important development, coming from a depth of 152ft. To facilitate the working of this ore-body the main shaft, which is equipped with a horse whim, should be sunk at least another 50ft., and a drive connected with the winze. It was stated that 200 tons, giving an average of 28 per cent., had been dispatched to the smelters. The output could, with little trouble, be rapidly increased. (I.M.R., 21-11-99.)

Again reporting, in July, 1900, the inspector says since his previous visit work has been continuous, and 70 tons of ore had been raised, varying in value from 11½ per cent. to 44 per cent. Operations have been continued to 180ft., or a little below water-level, and the work then in hand consisted of stoping at about 20ft. from the bottom, the formation being about 4ft. wide, containing veins and pockets of grey ore and copper glance, some portions being very rich, and when sorted averaging 25 per cent. A sample taken of the copper glance assayed 6ozs. 10dwts. silver and 51½ per cent. copper. The inspector's favorable opinion of the mine is confirmed, and the further sinking of the shaft is still urged, not only with the object of developing the property at the deeper levels, but also to facilitate its working. (I.M.R., 7-7-00.)

Owing to the presence of arsenic in the ore, satisfactory smelting arrangements could not be made with the local companies, and therefore, for some time past, little work has been done on the mine beyond that of a few tributers and picking over the dumps. In 1907 the mine was taken over by the Tasmanian Copper Company.

VOCAYOCANA.—This mine, situated W. from Apex Hill, has a well-defined N. and S. lode, and good grey ore has been raised from it. The lode shows for about 200yds. on the surface. (1860-69.)

VICKERY'S CLAIM.—W. of and adjoining the Warra Warra Mine. A shaft has been sunk 15ft., showing a vein of green carbonates 8in. thick, from which 2 tons of fair-grade ore have been obtained. The country rock is kaolinised, and has a very promising appearance for the occurrence of veins and deposits of rich ore. The shaft should be sunk much deeper, and the mineral-bearing strata crosscut at the lower levels. The ground being soft, work should not be expensive. (I.M.R., 17-11-99.)

VULCAN.—This was a claim taken up about 6 miles S.E. from the Wallaroo Mines. In costeaning a nice deposit of ore was found, and prospecting shafts were sunk, but the lode from which this bunch of ore was supposed to have been derived was never discovered. (1890.)

THE WALLAROO AND MOONTA MINING AND SMELTING COMPANY, LIMITED.

Wallaroo Mine.—This mine was discovered in 1860. It is situated on Yorke Peninsula, and is 10 miles N. from Moonta Mines, and now includes the Kurilla. It occupies rather over 2,000 acres of Crown lands. There are five lodes on the property, and there is the Kurilla lode. The main lode is nearly vertical, although occasionally the underlie is a little to the N., and sometimes a little to the S. Strike of lodes, 10° to 20° S. of E. The lodes vary in width, from a few inches to 12ft. or 14ft., and the ore they contain is chiefly chalcoppyrite. As raised from the mine it varies from 3 per cent. to 10 per cent., with occasionally small quantities of rich copper ore. The deposits of copper ore are chiefly along the lead of the lodes, and are associated with "gangue." There are no regular shoots. In connection with the limestone just above the lode, a little green carbonate of copper was found, but a large proportion of the green ore was atacamite. Below this oxides of copper were met with, both red and black, then grey and black sulphides with iron pyrites. These deposits of ore were mostly exhausted many years ago. Chalcoppyrite came in at varying depths of from 10 to 30 fathoms, and this is almost the only kind of ore now being raised at the mine. It continues down to the bottom of the deepest shaft. The veinstone associated with the metallic minerals is composed of portion of the bedrock, iron pyrites, calcareous spar, &c. The country formation is schistose rock. The quantity of ore raised from the time the mine was opened to December 31st, 1886, was 451,016 tons (of 21cwt.), of the value of £2,030,143 in the colony. It yielded, on the average, about 10 per cent. of copper. Thirty shafts, including trial shafts, have been sunk, the deepest being 195 fathoms. The water-level was reached at about 5 fathoms. The drives, levels, &c., including Matta and Kurilla, extend a distance of 20 miles. The yield now varies from half a ton to 6 tons per fathom. (1890.) The Moonta Mine has been amalgamated with this, which has besides taken over the Matta Matta, Kurilla, Devon Consols, &c. The value of ores won prior to the amalgamation was £2,229,096, and dividends paid £430,254. Since then the value has been, up to the end of 1898, £1,876,134; and dividends paid, £104,000. Taking both mines together the wages reached over £7,000,000, and the dividends realised amounted, it is said, to 25 per cent. The bulk of the ore broken at Wallaroo Mine is said to be fit for the smelters, say 12 per cent. It has been worked nearly 40 years, and the deepest shaft is 1,620ft., and sinking is now being continued. (1899 edition.)

Moonta Mine.—Discovered in 1861. It is situated on Yorke Peninsula, on the E. shores of Spencer Gulf. There are five main lodes on the property, and from each of these various spurs and minor lodes branch out, and are connected with the main lode by occasional cross veins. Including these there are 27 lodes. Their direction is N.W., and their underlie varies from 3ft. to 6ft. in the fathom. The main lode bears N. 20° E., and the others vary from that to N. 45° E. The width ranges from 6in. to 20ft., and the ore obtained from the main lodes in the present workings is chiefly chalcopryite and occasionally bornite. The bulk of the veinstone—chiefly quartz and at times portion of the bedrock—as raised ore and “gangue” gives from 2 per cent. to 5 per cent. of copper, but sometimes clean chalcopryite gives 20 per cent. to 30 per cent., and bornite from 30 per cent. to 50 per cent. The country rock is felsite porphyry, orthoclase porphyry, a special variety. The quantity of ore raised from the mine from the commencement to the 30th June, 1886, equalled (in gross tons of 21cwts.), 476,180 tons, and the average percentage of copper on net dry weight of dressed ore equalled 20 per cent., and the total value in the colony of this ore amounted to £4,579,097. Seventy-seven shafts have been sunk, including 21 trial shafts. The shafts are vertical for a short distance, then mostly follow the dip of the lode. The deepest shaft is 287 fathoms (1,722ft.), and the levels measure, approximately, 29½ miles. (1889.) The aggregate length for thoroughfares, including drives, winzes, and shafts, is about 42 miles. The water-level was reached at about 5 fathoms. The deposits of copper ore are chiefly along the lead of the lodes associated with “gangue,” the present supplies being mostly chalcopryite and occasionally bornite. An exceedingly small proportion of green carbonate ore was formerly found close to the surface; but a large proportion of the green ore was atacamite, and this was generally met with below the other. Sometimes red oxide was found with the atacamite. The yield varies from ½ ton to 8 tons per fathom. The peculiarity of this cupriferous district was disclosed by the removal of these ores and the sinking of the shafts—namely, that although the lodes continued regular, no further ore was met with, and, as a rule, no stain of copper was seen until the depth of from 5 to 10 fathoms was reached, when rich oxide and malleable copper deposits were struck, and after that black and grey sulphides. These deposits, however, were chiefly worked out in past times. Chalcopryite occurred at an average depth of about 20 fathoms, and this, with occasional deposits of bornite, has held down either in large or small proportions to the present deepest point of operations. This mine at one time employed upwards of 1,600 men and boys, and still keeps a very large number (1,138) at work. Copper ore raised during four months ending December 31st, 1889, 5,759 tons; assumed to be the average rate of output. This mine was amalgamated with the Wallaroo Mine in 1890. The latest information published gives the acreage held as 2,691, and states that on Elder’s lode Taylor’s shaft is now down 2,340ft., and that the lode there is 20ft. wide, but not rich. The deepest shaft on Beddome’s lode is now 1,600ft., and rich oxide is met with, giving from 20 per cent. to 70 per cent. fine copper. On Hogg’s lode sinking is being carried on below the 1,440ft. level. On Green’s lode they are down to 1,440ft., and the lode at that depth is not so productive as formerly. On Fergusson’s lode the depth reached is 1,500ft. The ores have to be dressed for the smelters, the bulk broken not averaging more than 3 per cent. for copper; and the ground is hard to work. The total value of ore raised to the end of 1898 was £5,113,252; wages paid, £3,945,252; and dividends distributed, £1,168,000. In the amalgamated mines more than 1,800 persons are employed. (1899 edition.)

Devon Consols (New Devon, or Gurner’s).—Shortly after the Wallaroo Mine had commenced working, a discovery in its vicinity, said to have been made whilst excavating for a water tank, was named the Devon Consols. A small syndicate took out a lease and did some work, getting a little good ore near to the surface, but afterwards forfeited their claim. Then a company was formed, ultimately having a nominal capital of £28,000. All the available part of that capital became

exhausted, and the affair was wound up, not for want of productive lodes and a good prospect, but for want of funds. It is stated that there are five proved lodes in the Devon Consols lease, running about E. and W. The country is a micaceous schist, decomposed as it approaches the lodes. At the time of stopping work, prior to the last change of proprietorship, there was at the bottom of one of the shafts a 6ft. wide lode of killas and ore, of which width 18in. was composed of yellow sulphurets. About 1,300 fathoms of levels were driven by the former proprietors, who had set up a 60 h.p. winding and pumping engine, with crusher and jigger, and separate steam power for working the machinery. After spending about £50,000 in developing the property, and getting everything into thorough working order, the mine operations ceased. (1899 edition.)

It now forms portion of the Wallaroo and Moonta property.

Kurilla Mine.—Situated a little to the S.W. of the Wallaroo Mines. It contains three lodes underlying N., with an E. and W. bearing, and having an underlie ranging from 1ft. 8in. to 2ft. 3in. in the fathom. The width of the lodes varies from 1ft. to 9ft., and the ore they contain is chiefly chalcopryrite. Sometimes, indeed, it is pure chalcopryrite, but in other instances it contains from 3 per cent. to 15 per cent. of copper. The veinstone associated with the metallic minerals is iron pyrites, portions of the bedrock, &c., while the country rock is talcose schist. Twenty-six shafts, including the trial shafts, have been sunk, the deepest of which is 498ft. The length of drives put in at various levels in 1886 equalled $3\frac{1}{4}$ miles. The water level was reached at 30ft. The deposits of copper ore are chiefly along the lead of the lodes, associated with "gangue," the present supplies being mostly chalcopryrite. In many ways this mine is similar to the Wallaroo Mines, the chief difference being that the veinstone is not so mixed with "gangue," so that the chalcopryrite is of a higher percentage. Accurate information with regard to the total amount of ore raised and its money value has not been obtainable; but during the 10 years from 1874 to 1884, the ore sold from this mine equalled 19,397 tons, of the value of £155,068. Of the ore raised prior to 1874 no record was kept, and of that obtained since 1884 it is probable that at least 1,000 tons have been sold, valued at £5,000. (1886.) (1899 edition.)

Matta Matta Mine.—Situated near Kadina and Wallaroo Mine, Yorke Peninsula. Two shafts were sunk, each to a depth of 20 fathoms, and a fine lode of ore, running about E.S.E. and N.W., was cut at the 10-fathom level. It contained green carbonate and grey sulphuret, with red oxide and a quantity of malleable copper. (Austin, 1863.) The mine was worked as a separate property for a short time subsequent to the beginning of the mining industry on the Peninsula. The operations of the proprietors were, however, suspended in consequence of the influx of water; and ultimately the mine was included in the property of the Wallaroo Company. (1899 edition.)

Wallaroo and Kurilla.—In August, 1904, the Inspector of Mines reports:—Throughout this property a large number of shafts have been sunk at various points. The principal ones have been Taylor's, 2,070ft., Office shaft, 1,920ft., and Young's shaft, 1,350ft. from surface. In consequence of the late fire the upper portion of Taylor's shaft has collapsed, making it advisable to sink a main vertical shaft from the surface, which will shortly be connected with the lower levels of Taylor's old shaft. The new or upper portion of this is 17ft. long by 6ft. wide, securely timbered, and divided in the necessary winding, pumping, and laddering compartments. With this work rapid progress is being made, the sinking averaging 75ft. per month, and good progress is being made in rising from the 125-fathom level upwards. When this is connected it is intended to continue the shaft vertically, and the same size, which is undoubtedly the proper course to adopt; consequently some considerable time will have to elapse previous to that portion of the mine being in the condition to produce its usual output. For the time being the reserves in other portions of the mine have to stand the strain of an increased supply, which, previous to the fire, was not anticipated. The principal stopes

from which at present the chief supply of ore is being obtained are at the 245, 205, and 185 fathom levels, which disclose a persistent well-defined lode, striking about E. and W., slightly underlying N; the main shoot of ore being fully 1,800ft. long, ranging from 3ft. up to 24ft. in width, which is dressed with various classes of suitable machinery, then dispatched to the Wallaroo smelters, and yields an average return of 11 per cent. copper. The Kurilla portion of the property is worked on a parallel lode to the depth of 1,170ft. The ore-body shows from 10ft. to 12ft. wide, but apparently is not so consistent in its value. The richer ore deposits occur in shoots and bunches, with bands of lower grade material, mixed with country rock. This, when broken, is dressed up to the usual standard 11 per cent., and at that value is forwarded to the reduction works. The machinery on the mines is of the most extensive and varied character, consisting of winding, crushing, concentrating plants, cementation works, and air compressors, each suitable for the work it has to perform, and capable of treating the various classes of ore on an extensive scale, and with a very close extraction. At the time of my visit there was a considerable quantity of machinery being erected, all being of the most approved pattern, substantial, and of sufficient capacity to continue the work to a much greater depth than that at present reached, all being supplied with electric light, and telephones from one portion of the works to the other.

In my examination of these properties, I am pleased to say that apparently every care is taken for the safety of the employes, not only in the underground works, where the timbering is of the most suitable kind for the various conditions, but in the surface appliances, such as winding, crushing, concentrating, and other works, all are securely and substantially fenced and enclosed to minimise the danger as much as possible. For the convenience of the employes large and commodious changing houses with drying apparatus and shower baths have been erected on the mine, also a suitable building of very neat appearance for a library, consisting of several rooms, fitted with electric light, and well supplied with papers, periodicals, and books of various useful kinds. The full number of employes is at present 1,130, irrespective of the Moonta Mines and Wallaroo smelting works. (I.M.R., 9-8-04.)

"The Review of Mining Operations for the Year ended June 30th, 1905," contains the following contribution from Mr. Hancock, General Manager of the Wallaroo and Moonta Mines, which is full of interest as showing what has been done and won from those valuable properties, and at what cost:—

Mining for copper on Yorke Peninsula dates back to just before 1860. The Wallaroo Mines are about 6 miles E., and the Moonta Mines about 12 miles S. of Port Wallaroo.

Both properties are connected by Government railway with the Port, where the company's smelting works are located.

At Wallaroo Mines the lodes traverse a metamorphic schistose rock, with a direction approximately E. and W. The various ore-bearing strata at Moonta Mines are composed chiefly of porphyritic rock, and the lodes (speaking generally) bear N. and S.

The dressed ore from Wallaroo Mines has, throughout recent times, averaged about 11 per cent., that from Moonta about 20 per cent. of copper, excepting that in later years it has been 2 per cent. or 3 per cent. lower. For a long time past the vein stuff as raised to surface at both properties has contained on the average from 3 per cent. to 4 per cent.

Latterly immense accumulations of tailings and slimes from mechanical dressing have been subjected to hydrometallurgical treatment, affording good profits.

For about 30 years the Wallaroo Mines and the smelting works were one concern, while the Moonta Mines were worked independently, selling their ore to the Wallaroo Company. The latter, being a private company, published no records; but from what information is available it would appear that during its separate existence £2,229,096 of red metal was extracted, besides nearly £339,000 produced from purchased ores. Apparently about £430,254 were distributed in dividends.

These copper values do not include those from the Moonta Company, whose published statements show that £5,396,146 worth of copper was raised, of which £1,168,000 were disbursed amongst shareholders as profits. The Moonta Mines have the distinction of being the first mining company in Australia to pay in dividends a total of £1,000,000, notwithstanding that the rich gold reefs of Victoria had been operated for years before the Moonta was discovered.

Since 1889, when Wallaroo Mines, with their smelting works, and Moonta Mines became one concern, copper worth about £4,281,342 has been produced, of which £224,000 have been distributed in dividends. In nearly 45 years these mines have raised and extracted about £12,245,554 worth of copper, and paid £1,822,254 as dividends. The money circulated in wages is not ascertainable, but some idea may be gleaned from the foregoing figures of the value of these mines to all sections of the community.

At the smelting works, in addition to the high-class copper of the well-known "Wallaroo" brand being produced, sulphuric acid and bluestone are manufactured.

Early in 1904 a fire in the main shaft at Wallaroo Mines completely destroyed the upper portion, and rendered useless the pumping appliances to a depth of 2,000ft. There was grave danger that the deep workings would be lost through the influx of water, but by strenuous exertions, and despite great difficulties, temporary pumping appliances were installed, driven by compressed air. These are now being superseded by an up-to-date electric scheme; also an extensive central steam power and compressed air plant is nearing completion. A new shaft has been sunk 840ft., to join the old one where the underlay passed to the vertical.

When the new surface and underground plant is completed Wallaroo Mines should be re-established on modern and profitable lines, and as the deepest levels (1,800ft. to 2,000ft.) show no diminution in value as compared to those of less depth, the prospect of continued operations for years ahead is promising.

As further illustrating the operations at the mines, some additional statistics are appended, which, although not absolutely certified, are believed to be practically correct.

Total dressed ore produced from the combined mines, 1860 to 1904, inclusive	1,540,180 tons
Average copper contents	15½ per cent.
Representing in fine copper	235,630 tons
Average yearly production of ore	34,226 tons
Maximum output in one year	40,222 tons
Total expenditure (largely wages)	£10,423,300
Average annual expenditure	£231,629
Average cost of each ton of dressed ore	£6 15s. 4d.
Number of employes at June, 1905	2,260
Maximum number of employes	2,600
Total amount of dividends	£1,822,254

Returns for the last three years show —

	Ore Raised.	Ore Treated.	Copper.	Approximate "Standard" Value.
	Tons.	Tons.	Tons.	£
Year ended June 30th, 1905	146,424	92,091	4,561	291,300
" " 1906	164,667	157,157	4,402	275,390
" " 1907	224,441	211,748	6,016	587,289
Totals	535,532	460,996	14,979	1,153,979

Number of employes, June 30th, 1907, 3,107; the previous maximum number of employes was 2,909.

The central steam power plant and electric drive and the electric pumping installation have been completed.

Taylor's shaft is in general use. Restoration of the drives and levels damaged by the fire has been continued without intermission and satisfactory repairs accomplished.

Development work at Wallaroo Mines has proceeded vigorously, and additional ore ground is being opened up as fast as possible.

As opportunities have offered development has also been undertaken at Moonta Mines, disclosing prospects which have warranted further work.

A railway has been constructed about $1\frac{1}{2}$ miles from Moonta Mines to North Yelta. This latter property, which was closed down in 1890 owing to the heavy slump in copper prices, has again been unwatered.

The company has recently purchased the Mid-Moonta, or Moonta Central Mine.

WALLAROO BEACH MINE.—Situated near Port Wallaroo, on the coast fronting the park lands. Returns for the six months ended December 31st, 1906, show that four shafts, each 30ft. deep, and one shaft 68ft. deep had been sunk, and 270ft. of crosscuts made. A lode had been found, and opening up upon it had commenced.

WALLAROO, HUNDRED OF, SEC. 661.—On examination, in the latter part of 1898, the Government Geologist found that on this mineral ground prospecting shafts had been sunk in a felsitic rock stained with carbonate of copper, and containing small branches and veins of carbonate of copper. The lode is said to strike E. and W. and dip N., and at the depth reached, 60ft., to have been small, and associated with branch veins.

WALPARUTA CLAIM.—Situated a mile S. from Walparuta Spring, on the Outalpa Run. Inspector Parkes, in 1895, reported that there were numerous small segregated veins of quartz and copper enclosed in indurated mica schist. Samples assayed gave a mere trace of gold, and the opinion of the inspector was unfavorable to further outlay.

WANDILTA MINE.—This was a discovery following the finding of the lode in the Cornwall Mine and adjacent to it. The prospectors sank to a depth of 30 fathoms, got a branch lode containing green carbonates and grey ore, and drove on it until it pinched. The Government Geologist, reporting on this property in September, 1898, mentioned that the main shaft was said to be 240ft. deep, and from it a lode 2ft. to 3ft. thick had been driven upon for 190ft. Prospecting operations are now in progress, and the ground is being tested at depth by means of a diamond drill. (1907.)

WARRA WARRA COPPER MINE.—The Government Geologist, early in 1898, reported upon this mine, which is situated 7 miles S. from Rischbeth's Well, and 1 mile E. of Tarlton's Nob, near Mount Nor'-West. The workings consist of vertical shafts 133ft. apart, sunk to 60ft. and 65ft., with crosscuts and drives to intersect and mine a lode formation which outcrops on an E.N.E. line. Shaft No. 1 discloses a mullocky lode formation 18ft. thick, with copper ore in small percentage. Shaft No. 2 cuts the same lode, which has been driven upon both ways a total of 72ft., there being good walls, the lode varying from 2ft. to 6ft. in width, the ore being of low percentage for copper. This lode contains green carbonates, native copper, copper glance, copper pyrites, red oxide, &c., associated with quartz, kaolin, gossan, and kaolinised rock, the latter being stained by carbonate of copper, country rock, kaolinised and indurated slates and flags, sandstone, and quartzite in alternate strata, dipping at high angles S. At depth the deposits of copper ore should be richer, and as a prospecting venture the chances of the mine are very good. An underlie shaft should be sunk on the lode to water level. There is at present no water for ore-dressing purposes, nor any timber in the immediate neighborhood. Acting on the advice of the Government Geologist, the No. 2 shaft was sunk down to 144ft. on the underlie, with assistance by Government subsidy, and copper was worked upon at that depth. (September, 1898.) More recently an inspection was made by the Government Geologist in relation to an application for another subsidy. He found the shaft was 157ft. deep, following the inclination of the lode, and that

a crosscut had been driven at the bottom across the lode 40ft., and was still in the formation, which was stained with green carbonate. Vertical depth from the surface 205ft. The large size of the lode formation increases greatly the amount of driving and crosscutting necessary in prospecting for the shoots of ore; but the soft nature of the formation and absence of water lessen the cost of work materially.

The mine was examined in December, 1899, by the Inspector of Mines, who reports that the lode outcrops on the surface, from 4ft. to 5ft. wide, and in depth it increases in size and becomes more friable; it consists chiefly of kaolinised material, carrying veins and pockets of the various classes of copper ore throughout. The principal work has been done at shafts Nos. 1 and 2, sunk 2 chains apart, and to the depth of 100ft. and 234ft. respectively. In No. 1 shaft, at the depth of 60ft., drives have been made along the course of the lode, exposing a copper-bearing material, from 14ft. to 18ft. wide, containing bunches and pockets of high-grade ore, chiefly green carbonates and grey ore. Crosscuts driven have also disclosed large quantities of highly copper-stained material, and shown that the better grade is chiefly on the footwall side, and from 4ft. to 5ft. wide. No. 2 shaft has been sunk on the footwall of the lode to a depth of 234ft., being about 200ft. vertical from the surface. At the 70ft. level drives have been put in on the lode, and a considerable amount of ore has been stoped. The lode formation is the same as in No. 1. Below the 70ft. the lode matrix is similar, but the veins and bunches are principally quartz and iron, except at the 140ft. level, where a band of kaolin was passed through, exposing in the footwall side green carbonates, assaying 20 per cent.; this, although small at present, should be followed, as possibly the main ore body may be faulted in that direction. A crosscut on the footwall side would determine this. At the bottom a crosscut is driven towards the hanging-wall side, a distance of 100ft., passing through the same class of material as above the band of kaolin. The formation is slightly copper-stained, but is of no particular value, except at one point, about 60ft. from the shaft, where a vein or bunch of green carbonate 8in. thick has been passed through, a sorted sample of which assayed 19 per cent. From the end of the crosscut, on the hanging-wall side, a drive has been made in an E. direction for 100ft. In places the material is copper-stained, being an indication that the formation is metal-bearing. It is recommended that the shaft be carried to water-level, to obtain water for ore-dressing, and to ascertain what change may take place there. A considerable quantity of ore can still be stoped above the 70ft. level, and dressed up to marketable value, in which operation water would be of great aid. It was stated that 80 tons to 100 tons of ore, worth from 20 per cent. to 24 per cent., had been sent away. The prospects warrant further development of the mine, and extraction of the ore in sight. (I.M.R., 5-12-99.)

A departmental report, dated August 1st, 1902, states that No. 1 shaft is 109ft. deep; No. 2, 70ft. vertical, 157ft. underlie, 227ft. = 208ft. vertical; No. 3, 35ft.; and No. 4, 86ft. underlie.

On January 26th, 1905, it is reported that a new shaft (Fabian's) has been sunk 79ft. underlie, that the mine has been worked on tribute for the past two and a half years, and that no work has been done in the old workings for two years.

The property has now been acquired by the Tasmanian Copper Company.

WARRIOOTA MINE.—Situated on the N. slope of a low range, about 10 miles S.E. from the township of Beltana. The ore deposit is a lode 1ft. to 2ft. wide, which strikes E. 15° N.—very nearly coincident with the strike of the country—but dips irregularly through the latter, first for a few feet vertical in depth, and then at an angle of 70° N. The hanging-wall looks well defined, but the footwall seems irregular. Judging from the nature of the veinstuff left near the two deepest shafts, the general mineral character of the lode alters within a short distance. At the one shaft it is composed of a soft, somewhat calcareous quartzose mullock, densely traversed by thin quartz veins; these enclose small nodular masses of earthy

malachite, and occasionally of azurite, associated with calcite. A trial of some of the ore gave traces, though very faint, of bismuth. Specimens of veinstones left near the other shaft consist of a dense and hard ferruginous and highly quartzose striped matrix enclosing thin seams and small druses of acicular crystals of malachite, besides veins of cupriferous gossan. In general these veinstones resemble the poorer surface stone of the Blinman Mine. No traces of sulphide ore could be detected. The country in the neighborhood of the workings looks undisturbed, and consists of alternating beds of thin cleavable slates and fine-grained thin-bedded partly micaceous slaty sandstones; strike, E. 40° N.; dips S. at an angle of about 35° some distance S. of the workings near the line of the lode. Judging by the rather poor ore last raised and left on the ground, the future prospects of the mine are not very favorable. If gold crushing and saving machinery were at hand, the trial of a few tons of the lodestone for gold is to be recommended, and the prospecting for this metal generally in the gullies and in the quartz reefs in the neighborhood. In fact, a zone of country of considerable width exists in this neighborhood which is traversed by strong promising-looking quartz reefs, and altogether presents an auriferous aspect. (Ulrich, 1872.)

WALTERS' WELL—Mount Lyndhurst district. Formerly worked for copper, parcels having been sent away which, it was stated, yielded 28 per cent. The lode is 5ft. wide, and consists chiefly of siliceous copper-stained ironstone, and looks promising for gold; a sample taken close to the surface assayed 2dwts. of gold per ton. Sample taken from small parcel of dressed ore on the floor gave 10 per cent. of copper. (I.M.R., 3-8-99.) *Vide* NEVADA, page 101.

WEEDNA MINE.—Found by S. C. Gubbin, in 1898. In 1899 it was taken over by "The Associated Copper Trust." The Inspector of Mines furnished the following report in November, 1899:—Situating 42 miles N.E. from Leigh Creek, and 1½ miles from Weedna Springs. The company held 24 20-acre blocks; the principal work done being on block 669, which is situated on a small ridge on the bank of Weedna Creek, and is almost surrounded by high rugged hills, composed chiefly of clayslates and sandstone. From the small amount of development work done on the surface, and the short length of outcrop exposed, it is difficult to determine the proper strike of the lode, but it appears to run about N. and S., with an underlie to the W. of about 18in. in 6ft.; also on the surface there is the outcrop of a cross lode, striking about E. and W., which junctions with the other ore-body at the point where the main operations were in progress. The mine was being worked principally from an old shaft sunk by the prospector to the depth of 50ft., water-level, and the formation from this level to the surface is composed of kaolinised matter and clay, containing strong veins, bunches, and pockets of green carbonates, grey ore, black oxide, and a little azurite; the exact width of the ore-body here is difficult to determine, owing to the absence of crosscuts, but it is evidently considerable. N. and S. drives have been made, the first 33ft. from the shaft at the 25ft. level, and 18ft. at the 50ft. level. No walls are visible, and the faces expose good carbonate ore of fair value. The S. drive extends 62ft., and is connected with the main shaft, then in progress. A considerable amount of stoping had been done from the 25ft. level upwards, and a large quantity of fair-grade ore obtained and dispatched to the smelters. The main shaft, 10ft. 6in. by 5ft. in the clear, and then sunk to a depth of 50ft., is situated 62ft. to the S. of the prospector's shaft; it is well equipped, and a small engine was provided for hauling. The lode at the bottom showed clear and well defined, with walls 12ft. apart, the formation and ore deposits being similar to those obtaining in the prospector's shaft. At the time of the inspection the fortnightly output of 18 per cent. ore was 25 tons, and it was stated that the ore was assaying well for gold. A 2in. line of pipes from the Weedna Springs, which are 100ft. higher than the mine, gave a good supply of fresh water. Only a small amount of prospecting had been done on other parts of the property. Eight samples taken for assay ranged from 3¼ per cent. to 15¼ per cent., the average being 10 per cent. (I.M.R., 23-11-99.)

The main shaft was continued to a depth of 150ft., and close timbered with sawn oregon timber. Work was carried on by the company for some little time, but suddenly ceased, and the mine was abandoned. It was afterwards taken up and is being worked by prospectors, who remove ore by new drives, stopes, and workings from and connected with the original prospector's shaft. A fair quantity of good-grade ore is being raised. (25-4-04.)

Lately the ground has been taken over by the Tasmanian Copper Company.

WELCOME MINE.—Situated 68 miles N.E. from the township of Beltana, and about 18 miles S.E. from the Yudnamutana Mine. There are two small batches of workings on adjoining spurs—a higher and a lower one. The workings on the higher spur consist of an open trench, 3ft. to 4ft. wide and about 40ft. long, exposing a quartz reef of 1ft. or 2ft. in thickness. It strikes N. 32° E., and dips N.W. at 62°. The underlie wall is well defined, and is composed of a gritty silicified sandstone and boulder conglomerate. The enclosed boulders are mostly quartzite. The hanging-wall is less regular, and is composed of fissile, rather concretionary slates. These appear to have been disturbed, as on the top of the spur they show a very flat dip of about 8° to 10° S.W., while further off they strike N. 30° W. and dip W. 30° S. at 20°. In the reef, and in a few feet of the hanging-wall, are exposed solid patches and thick veins of ore, consisting of grey oxide, coated generally with green carbonate and chloride of copper. The ore-bearing part of the country does not seem to extend much beyond the trench on either side, for towards the S. the ore patches disappear and the veins split and thin out, and N. from the trench no ore is traceable for more than a few feet. In the second batch of workings the ore is of a similar character to that in the first batch. (Ulrich, 1872.)

About 16 miles from Woollana Head Station. The Inspector of Mines, reporting in June, 1900, says that the principal workings are on the spur of a very high rugged range, and consist of an open cut 2 chains in length, from 3ft. to 8ft. in depth, and 4ft. wide. Apparently a fair quantity of copper ore has been obtained, but as the formation continues down, and also at each end, the copper contents of the ore decrease to a very low grade. The country rock is slate and sandstone. (I.M.R., 29-6-00.)

It is now included in the holding of the Great Boulder.—*Vide* page 57.

WEST DOORA.—Situated between the Doora and Derrington Mines. A great deal of costeaning was done in search of the Doora lode. The claim was subsequently abandoned. (1874.)

WHEAL AUSTIN MINE.—This is situated $\frac{1}{2}$ a mile S.S.W. of the Yudnamutana Mine. There is an immense reef of ironstone and gossan, containing strong stains of copper and numerous stones of green carbonate and grey oxide. It is from 18ft. to 20ft. in width, and its course is very regular. (Austin, 1863.)

WHEAL BASSETT COPPER MINE.—Situated 3 miles S. from Nackara Railway Station. The Inspector of Mines reported (March, 1892) that four shafts had been sunk on a calcareous mullocky vein, in which there was green carbonate of copper. No. 1 shaft was down 160ft.; the others from 40ft. to 50ft. No definite vein, only segregated veins copper-stained. He was of opinion that the property was of little value.

Recent returns show that small parcels of ore from 15 per cent. to 33 per cent. have been marketed from this mine.

WHEAL BESLEY MINE.—Situated about $\frac{1}{2}$ a mile E. of Angepena Hill. There are two lodes on the section bearing very good gossan, impregnated with green and blue carbonates, and containing occasional good stones of ore. The lodes run N. and S., and are traceable for a distance of 300 yards. Liver-colored and yellow ore is found scattered on the surface. (Austin, 1863.)

WHEAL BUTLER.—This mine is about 2 miles N.E. from the Blinman. A good lode, from 1ft. 6in. to 3ft. in width, passes through the property, and this has been opened at intervals for nearly a $\frac{1}{4}$ of a mile. It yields a peculiar reddish-brown or liver-colored ore, supposed to be merely a variety of ironstone, but which, on being

assayed, produced 37 per cent. of copper. The back of the lode consists of ironstone, micaceous iron, gossan, and quartz; and, below these, stones of green and blue carbonate and a quantity of liver-colored ore are found. The underlie is about 3ft. in the fathom. (Austin, 1863.)

WHEAL DEVON.—This was a prospecting venture near Kadina (section 201, hundred Wallaroo), commenced in search of the Kurilla lodes. There was a fair amount of costeaning, and a downright shaft was sunk about 10 fathoms; also a little driving was done, but with poor results. The venture was then abandoned. (1874.)

WHEAL FORTUNE COPPER MINE.—Locality, Green's Plains. An old mine; a shaft sunk to a depth of 13 fathoms, and a lode 18in. wide; the ore said to be of excellent quality. It was worked in 1861-2, held by a company of Moonta miners, who regarded it as a good prospecting venture.

WHEAL FRIENDSHIP.—Worked on a lease from the Britannia Mining Company as a prospecting venture; abandoned in 1857, at the time of the gold exodus.

WHEAL FRIENDSHIP.—Situated 23 miles N.E. of Quorn. There are several lodes and veins of siliceous calcite, from 15in. to 4ft. wide. The work done on block 42 consists of an open cut on the line of lode for 60ft. in length, several small openings, and one shaft, sunk to a depth of 50ft.; the copper-bearing vein is continuous and well defined, and averages from 15in. to 18in. in width, and consists chiefly of low-grade green carbonate. At the shaft bottom, which is water-level, it contains a little yellow ore, and there is every appearance of a change taking place in the ore. A sample assayed $2\frac{1}{4}$ per cent. On block 41 several small shafts, from 10ft. to 20ft. deep, have been sunk on apparently parallel lodes, having the same permanent appearance, but much larger, ranging from 2ft. to 4ft. wide, with very fair veins and patches of ore, but not sufficient so far to be remunerative. The lodes strike N. and S., with a W. underlie of 2 in 6. They are very regular and well defined; the general appearance is promising, and they should be further prospected by sinking a shaft W. of the line of lode, to a depth of at least 100ft., to intersect the lodes at that vertical distance, where the chance of success is greater than above. The same suggestion applies to block 42, which should be explored below the water-level. (J.M.R., 19-12-99.)

WHEAL FORTUNE MINE.—This mine was on land leased from the Paringa Mining Company (1850), in the Mount Barker district. It yielded black oxide and other ores.

WHEAL FROST.—Situated about 5 miles E. from Yudnamutana. It contains an extraordinary deposit of copper ore on a range about 350ft. high from a creek on one side, and between 400ft. and 500ft. from a creek on the other. The top of the range for 80ft. or 90ft. in height consists of a mass of granitic rock—from which the upper soil has either slipped or been washed away—leaving the rock exposed; it is almost perpendicular, and contains numerous green stains of copper visible for a distance of a $\frac{1}{4}$ of a mile or more. On examination, almost everywhere—even where no stains exist—rich copper ore was found, grey oxide and green carbonate, especially in small caves or holes in the rock. Below the rocks, and down to the gully, bits of malachite and various oxides and carbonates were found on the surface, also ironstone, gossan, killas, limestone, sandstone, and greenstone. (Austin, 1863.)

Professor Ulrich says that this is described as a small conical mountain of greenstone thickly impregnated with green carbonate and red oxide of copper. "All these copper outcrops are situated within but a comparatively small extent of country, viz., in the wild mountainous district between the Stanley and Yudnamutana Mines, which seem to have a special attraction for prospectors, yet it is my opinion, for geological reasons, that not only this small part, but the whole belt of rangy country N. of the main range—stretching from W. of the Yudnamutana Mines towards the Freeling Heights—has good chance of containing copper ore deposits and, perhaps, also gold—of lodes of the former the best defined and

most promising very probably in the lower rangy country, at the foot of the high steep mountains; and also that the S. side of that range, which seems hitherto to have been neglected, deserves, for similar reasons, the attention of the prospector." (Ulrich, 1872.)

A departmental report on the Wheal Frost, dated October 18th, 1901, states that three men were at work quarrying copper ore from a perpendicular cliff of quartzite highly stained with green copper carbonate, and carrying bunches of grey ore, malachite, and ferruginous copper ore. Since September, 1900, 20½ tons of 25 per cent. had been obtained and forwarded to the smelters. A further report, dated August 27th, 1902, shows that no further work had been done, and the claim was abandoned.

WHEAL GLEESON.—One of the Yudnamutana mines. There are three shafts. The lode strikes irregularly N. and S., with a dip steeply E. It is apparently from 1ft. to 3ft. in thickness only, and consists, near the surface, of rubbly slate, mullock full of veins, and irregular masses of brown and micaceous iron ore, enclosing seams, solid patches, and coatings of earthy malachite. (Ulrich, 1872.)

This was at one time a portion of the Yudnamutana holding, and is situated on the opposite side of the creek. Three shafts have been sunk, the deepest being a little over 100ft., and, judging from the quantity of material on the dumps, a considerable amount of work has been done, but the underground workings could not be examined. On the surface the lode has been worked for about 7 chains in length, and from 3ft. to 8ft. in depth; it varies from 1ft. to 4ft. in width, and consists of slaty lode matter, containing a number of small veins, carrying micaceous iron, malachite, and a little green carbonate. The strike is about N. and S, with an E. underlie. (I.M.R., 29-7-99.)

WHEAL HANCOCK MINE.—Locality, adjacent to the Welcome Mine, 68 miles N.E. from Beltana. There is a good lode distinctly traceable for about 250yds. It is about 18in. wide, and consists of fine grey oxide. There are veins and stains of ore, with small pieces of malachite scattered on the surface near the lode, which runs N.E. and S.W., underlying W. into the hill. (Austin, 1863.)

WHEAL HUGHES MINE.—This property is situated not more than a mile distant on the N. side of Moonta, and N.W. of Moonta Mine. In the outset the discoverers obtained a good deposit of yellow ore coated black. This cut out, and a good deal of money was spent in further search. The mine then lay unworked for a number of years, but in 1890 an unsuccessful effort was made to rework the property, which is believed to contain valuable lodes. About to be restarted. (1899.)

Now included in the Paramatta and Yelta property.

WHEAL HUMBY MINE.—Situated 4 miles S.W. from Moonta. Indications, similar to those at the Moonta, led to sinking to a depth of 4 fathoms, when the back of the lode was cut, consisting of ironstone mixed with green carbonate of copper. (Austin, 1863.)

WHEAL JAMES.—This mine, adjacent to the Wheal Hughes, was discovered prior to, and led to, the finding of the Paramatta, and at one time a great deal of exploratory work was done. The quantity of ore raised was not remunerative, and operations ceased. A good opinion is still held respecting this venture, though it has not been worked for many years. Work to be resumed. (1899.)

Now included in the Paramatta and Yelta property.

WHEAL MARIA.—This mine is situated 18 miles S.E. from Adelaide. It was opened as a copper mine about the year 1850, but not being immediately productive and the prospectors lacking capital, it was abandoned. About the year 1886 it was reopened as a silver-lead mine. (See *ALMANDA*, page 163.)

WHEAL MARIA.—Situated between the Daly and Yudnamutana mines, has a good lode of ore traceable for 130yds. N. and S., in a favorable country for copper. (Austin, 1863.)

WHEAL GOLD COPPER MINE.—This was a speculative venture, situated N.E. of the Mattapara, taken up in the expectation of discovering a continuation of the Mattapara lode, and abandoned some years ago. (1874.)

WHEAL MIXTER.—Locality, close to the beach, near Wallaroo. It was worked by Captain Hughes long before the discovery of the Wallaroo Mine, copper ore having been picked up freely. The influx of water prevented work being continued.

WHEAL SARAH MINE (also known as the "Bundaleer").—Situated in the neighborhood of the Bundaleer Station. There are three E. and W. lodes, with a dip of 75°. They have been worked a few feet only. The ores are micaceous iron mixed with green carbonates and sulphurets. The country is hard siliceous white and brown rock, with bands of grey arenaceous slates and brown sandstone, with a dip W. 85° to 90°. (Selwyn, 1859.) It is stated that specimens of the ore exhibited in Green's Exchange in 1858 ran to 50 per cent. for metallic copper.

WHEAL STUART MINE.—Situated about 3½ miles S.S.E. from Moonta. A quantity of green carbonate ore was found on the surface. A shaft was sunk 8½ fathoms, through gossan, steatite, ironstone, and quartz. (Austin, 1863.)

WHEAL SUSAN MINE.—Locality, on the E. plain, near Paralana. There is a strong lode of ironstone running above the surface for 50 or 60 yards, containing grey copper ore and green carbonate. There is also a good crosscourse running into the lode. (Austin, 1863.)

WHEAL TURNER (now known as the "Red Bluff").—This mine, situated about 6 miles S.W. from Yudnamutana, was examined by the Inspector of Mines in October, 1889. A bold hill of quartzose rock, rising abruptly from a creek 400ft., shows several copper-bearing lodes running N. and E. In No. 1 shaft (50ft.) a large lode of excellent copper is disclosed, and No. 2 (16ft.) shows a kindly formation, good walls, and a fair percentage of copper in rich veins. Other good prospects on the property have not been opened up much, but prove that there is a large extent of cupriferous country. The difficulty in working this mine is its distance from a railway, so that the ores require dressing to a high percentage for transit. Mr. Barrett, the secretary, furnished (April, 1890) the following particulars:—

There are eight lodes upon the property, varying in width from 4ft. to 20ft., and four shafts have been sunk, following the dip of the lode, the greatest depth reached being 54ft. The ore consists of green carbonate, azurite, copper glance, grey ore, and red oxide, the matrix being quartz and iron, and the country is sandstone and clayalate. The bulk average assay shows 25 per cent. copper, from hand-dressed ore; and the mine, which has a satisfactory prospect, is as yet only in its infancy.

The Inspector examined the mine in October, 1890, and reported that a shallow pit had been sunk on a large lode in the N.E. section, from which carbonate of copper had been taken, the enclosing strata consisting of micaceous schist and sandstone. The main workings were half-way up a high rugged hill, which exhibited an immense outcrop of quartzite veins, and bunches of very rich carbonate and cuprite ore penetrated for a long distance along its course. Several shallow shafts had been sunk on the footwall of the lode, the deepest being only 54ft. All the open workings and pits examined showed payable ore. A spur vein, sunk upon 8ft., carried some very good ore, covered with soft calcareous clay. W. of the main workings is a large outcrop of earthy iron ore, which should be tested for silver. On the N.W. section there is an outcrop of calcspar, in which is carbonate of copper. The Government Geologist examined this mine in 1893 and described the workings. He stated that places were shown in the cuttings or stopes where bunches of rich copper ore, namely, grey and red oxide, carbonate, and chloride, had been extracted, and that there was every indication of a good lode existing below. Fine gold was visible in the gossan. There is in the claim an ironstone blow, apparently a lode outcrop, and quartz reefs. Up to date little work had been done beyond stoping out the ore in sight on the surface and driving tunnels. An auriferous mullocky formation is in No. 2 tunnel, and the kaolin and iron ore veins are similar to the rich auriferous veins worked on the Echunga Goldfields. The property should be more thoroughly prospected.

The Inspector of Mines, Mr. W. H. Matthews, reports in July, 1899:—The workings are on a round knob formation, rising abruptly to the height of about 350ft. above the level of the creek. The lode, so far as can be ascertained, can only be

seen on the S.W. side of the knob, about 50ft. from the top, running for some 50yds. in length; it is mineralised, the prevailing metal being copper, blue and green carbonates; the enclosing rock is chiefly quartzite. The principal workings consist of two tunnels and two shafts, also a water shaft, sunk some distance away. No. 1 tunnel has been driven about 90ft., passing through a lode formation about 20ft. in width, of low-grade copper material, very siliceous, and intermixed with intrusive rock, the veins of ore being principally green carbonate. Fifty feet from the hill top, and slightly N. of the tunnel, an opening has disclosed a vein of ironstone and malachite, but of very low value. No. 1 shaft, situated about 80yds. in a S. direction, is an underlie shaft sunk on the lode formation to a depth of over 100ft.; the lode matter is of a sandy friable nature, and contains seams of copper-stained ironstone. No. 2 shaft, about 50yds. further in the same direction, is about 80ft. deep; it could not be examined, but, judging from the the surface dump, is still in country rock. No. 2 tunnel has been driven 356ft., a considerable depth below No. 1; at about 180ft. a broken formation was passed through 20ft. wide, containing a number of copper-stained ironstone veins, not of any particular value. Samples taken gave the following results:—

Ferruginous quartz, assayed for gold and silver, nil

Quartz and malachite, gold and silver, nil; copper, $2\frac{1}{2}$ per cent.

Siliceous material, gold and silver, nil

Siliceous ironstone and malachite, gold and silver, nil; copper, 2 per cent.

(I.M.R., 27-7-99.)

Only small and desultory operations in the way of prospecting and ore-picking from the old dumps have taken place here for a good many years.

WARNER'S.—Adjoining Mount Fitton South Mine on the S.W. An opening has been made in a large quartz lode, which carries copper glance in large and small bunches, and disseminated in splashes, and also carbonates in stains and coatings. It strikes N. 70° E., and underlies S. at a very flat angle, and can be traced along the surface for over 10 chains. The thickness has not yet been determined, but the outcrop exceeds 20ft. From an open cut, 25ft. long and 6ft. deep, 2 tons of hand-picked ore and 5 tons of concentrating material has been taken. Should be tested at depth. (George, 27-8-02.)

WHITE ANTS (RILEY'S).—S. of and nearly adjoining the Lady Buxton. A shaft has been sunk 17ft., and a tunnel 10ft. long, driven on two different veins of quartz, carrying small splashes of copper glance and occasional specks of gold. The quartz in each place varies from 3in. to 12in. in thickness, and is worth further prospecting. (George, 27-8-02.)

WHITE LEAD.—Situated 3 miles S.W. of Mount Lyndhurst. A little prospecting has been done by trial pits and cross trenches for a considerable length, and 100ft. in width, on a strongly mineralised formation, traversed by veins of carbonate and grey ore, from 6in. to 2ft. in width, and from which, even with the small amount of work done, several tons of fair-grade ore had been sent away. A sample taken from the veins assayed 13 per cent. The property should be further prospected by sinking a shaft in the centre of the formation, and crosscutting on each side, at a reasonable depth. (I.M.R., 2-8-99.)

WHYTE PARK MINE.—Locality, forest reserve, Wirrabara. Prospecting has been done by means of three shafts, two winzes, and two drives. Copper ore of poor quality has been found, in conjunction with calcite. Quite as much testing has been done as the indications and locality warrant. (Inspector of Mines, 1890.)

WILLIGUN HILL MINE.—Locality, adjoining the Stanley Mine, 2 miles S. from Mount MacDonald. On the S.W. portion a shaft has been sunk 30ft. (Inspector, Mr. D. D. Rosewarne, 2-10-90) on the footwall of a very large lode of ferruginous quartzite, and good copper obtained. Strike of lode 90° , with a dip S. The enclosing strata consist of indurated slates and sandstone. It is a good mineral property, and should have adequate capital for development.

WILLOURAN MINE.—Situated 14 miles S.W. from Hergott, and about 5 miles N. from Willouran Hill. This mine was opened about the year 1880, and 100 tons of copper ore was raised and sent away, the average produce being 24 per cent. of fine copper. The ore is very ferruginous, and is combined with oxides and oxychlorides of copper. The lode is traceable along the range for a distance of 4 miles, and ore has been found, with a few slight breaks, for several miles further. A shaft was sunk to a depth of 50ft., and a drive was put in for about 100ft. on the course of the lode. Nodules, apparently of iron, are found on the surface, but, when broken, the iron is found to be but a thin coating, the bulk of the stone being grey oxide of copper of 35 or 40 per cent. The district further N., beyond the "Dome," contains other rich deposits of copper. (Austin.)

WINDITTIE MINE (also known as the "Arno Bay Mine").—Hundred of Mann, Franklin Harbor District. In the early "seventies" a shaft was sunk on a lode showing green and blue carbonates. A strong influx of water was met with, and a whim was erected, but operations were discontinued for years. In November, 1903, Inspector Matthews says, "From my examination of this property the prospects appeared to me sufficiently good to warrant the expenditure of unwatering the shaft to ascertain its true value below water-level; until this is done no reliable opinion can be given in regard to its future prospects." (I.M.R., 5-11-03.)

WIPERAMINGA MINE.—Situated near Boolcoomata, 43 miles N.E. of Mannahill. Two or three shafts and open cuttings have been made on quartzite reefs, stained with blue and green carbonate of copper. The quartzite and micaceous schists and slates are penetrated by coarse granite dykes. This mine has been abandoned for some time, and, as far as can be judged, no defined lode has been found. (1885.)

WIRRAWILKA MINE.—This property is situated 14 miles E. from Hawker, and about 2 miles N. from Mount Plantagenet. The rocks of the country seem principally to consist of metamorphic slates and limestone. Some irregular workings in the limestone appear, from specimens left on the ground, to have yielded some very good ore, grey oxide of copper enclosed in concretionary masses of green carbonate. The ore appears to occur in pockets, as there is no evidence of a lode crossing the limestone. The limestone is hard, sometimes coarsely crystalline, and is coated with green carbonate, and shows abundant joints and crevices. Another batch of workings consists of one deep and four shallow shafts, sunk in line, over a length of 3 chains. The ore deposit here is a contact lode, bearing a great resemblance to that of the Yudnamutana Mine. It runs at a strike of N. 15° E., with apparently a steep W. dip, within the boundary of a strong dyke of diorite greenstone and chloritic and micaceous slates; these near the surface are very soft and friable. The copper ore raised appears to have been green carbonate, rarely associated with grey oxide of copper. From masses lying near the shafts, it would seem as if micaceous iron ore, calcite, and lode slate were the nearly exclusive occupants of the lode fissure, and that the copper ore occurred very sparingly through them. A mineral, abundant in the spoil heap of the deepest shaft, of lavender-blue color and fibrous texture, proved to be the rare species of crocidolite or blue asbestos. (Ulrich, 1872.)

WIRRAPOWIE MINE.—Situated about 3 miles S.E. from Mount Brooke. The following information concerning its early history is extracted from a letter, dated October 18th, 1899, written by the late H. Paull, a well-known miner and prospector of the northern districts:—"The Wirrapowie Mine was first opened by me, and is a true fissure lode traceable for at least one mile. I cannot remember the quantity of ore I sent from the mine, but sank the deepest shaft 13 fathoms before I was joined by Messrs. H. C. Swan and J. Warwick. Conjointly we attained a depth of 23 fathoms, the lode still going down strong; but the price of copper becoming low, we abandoned. The lode trends E. and W., dipping S. towards an enormous course of iron,

and I am of opinion that at the junction of the two a big thing will be the result. Some work has been done since I was there, and I am informed that water has been cut. One of my assays of a parcel sent down gave 33 per cent. copper, 15dwts. gold, and 5ozs. silver."

WOMAN IN WHITE MINE (MOUNT CULTALGA).—Worked both for copper and gold. Situated $1\frac{1}{2}$ miles S. of old Boolcoomata Station. The lode is very large, and consists of a quartzose, feldspathic, ferruginous veinstone, often stained with carbonate of copper. Its width is unknown, as no walls or junction with the bedrock have been observed. The workings consist of an excavation from 30ft. to 40ft. wide, and from 20ft. to 30ft. deep, from which has come about 1,000 tons of stone for crushing. The yield of gold per ton has varied from 8dwts. to 17dwts. In addition to the excavation, several prospecting holes have been sunk along the line of reef. The water-level is about 70ft. from the surface. The gold is fine, and is disseminated through the veinstone, which, besides being stained with carbonate of copper, often carries copper pyrites. The bedrock consists of metamorphic, micaceous, and hornblendic gneissic schists, traversed by coarse granite dykes. In the vicinity of the workings there is a mass of diorite and micaceous diorite. A further exploration is desirable, as there is good reason to suppose that payable gold will be met with. (1887.) At a later period the Inspector of Mines reported that the general appearance of the lode matrix was similar to the richer portions of the reef exposed in the Alma and Victoria Mine, and that it was a fair prospect, worthy of a full test. A feature in this mine was the occurrence of native copper in the country rock.

Mr. Inspector Matthews reports in February, 1900:—The principal workings have been confined to block 1467, and consist of an open inclined cut 25ft. wide, nearly 100ft. in length, and from 50ft. to 60ft. in depth at the deepest point. From this a large quantity of quartzose, ferruginous material has been raised, which, it was stated, yielded from 8dwts. to 17dwts. of gold per ton. No defined lode or walls are visible, and it has the appearance of a mass of country rock, strongly copper-stained throughout, with, in places, seams of blue and green carbonates and bunches of copper pyrites, but of low grade in bulk. From the surface down to about 20ft. the excavation was previously worked for gold, the material from the surface to that depth containing small iron seams, which have filtered through the joints of the rock, said to have contained gold to the amount stated. About 2 chains in an easterly direction three shafts have been sunk, the deepest being about 50ft., but judging from the debris on surface, no metal-bearing formation has yet been encountered. Twenty chains W. of the main workings two small shafts have been sunk, about 20ft. each, in hard micaceous diorite, showing copper stains and small bunches of ore, but in no defined vein, and of little value. In block 1766 two openings have been made, 6ft. deep, on what is apparently a parallel formation; each discloses copper-bearing material of low value. One of the openings also contains a considerable amount of iron, and might be further tested by sinking a few feet deeper. It was stated that previous to the suspension of operations 78 tons of 7 per cent. copper ore had been sent away. Samples taken assayed as follows:—

No. 1.	Ten feet deep, N. side of open cut . . .	4dwts. gold	
No. 2.	" " S. side of open cut . . .	trace	"
No. 3.	Open cut. 20ft. deep	5dwts. "	1 per cent. copper
No. 4.	Bottom of open cut	6 $\frac{1}{2}$ per cent. copper	
No. 5.	" " "	4	" "

(I.M.R., 19-2-00.)

WHITFORD'S.—Situated about $\frac{3}{4}$ of a mile S. from Depot Springs. A shaft, 20ft. deep, with a drive at the bottom of 8ft., and several shallow pits and costeans, have been made on a vein of siliceous ironstone and ferruginous calcite, carrying small bunches of copper glance and ferruginous copper ore. About 4 tons of ore were raised and sent away, but the amount of copper in the vein seems very small. (George, 27-8-02.)

WILLIAM'S.—S.E. and adjoining Whitford's Claim. A pit has been sunk on a vein of specular iron about 9in. thick, carrying a little copper glance, and another pit has been sunk in dolomitic limestone, which carries small splashes of copper glance. (George, 27-8-02.)

WOODLAMULKA (formerly known as "Utanda," and "Anker and Garrett's Claim").—Situating about 4 miles N. from Woollana Station. Here a lode, consisting of quartz, ferruginous calcspar, and argillaceous matter, carrying copper glance, blue and green carbonates, and iron oxides, strikes N. 65° E. and underlies S.E. at an angle of 73°. An inclined shaft has been sunk to a depth of 100ft. drives put in at the 100ft. and 50ft. levels, and stoping done, and about 10 tons of ore sent away. The lode seems to vary from 6in. to 20in., but walls are not properly defined. About 45ft. S.W. of No. 1 another shaft has been sunk 75ft. on the hanging-wall side of the lode, but has been dismantled. About 8 chains N.E. from the main workings a shaft has been put down about 18ft. on a vein of calcite, ferri-calcite, and iron oxide, carrying green carbonate and splashes and bunches of copper glance, and ruby oxides. It appears to be a continuation of the vein in the main workings, and is from 3in. to 15in. thick. Worth further prospecting. (George, 27-8-02.)

A later report says:—The old workings consist of several shafts sunk on an irregular lode formation consisting of argillaceous matter, ferruginous calcspar, and quartz, carrying veins and bunches of blue and green carbonates and copper glance; it can be traced on the surface for about 4 chains, strikes a little to the S. of W. and dips S; the width appears considerable, but has not yet been defined. Recently a prospecting underlie shaft, about 30ft. deep, has been sunk on a copper-carrying vein, about 15in. thick, which at the bottom turns vertical. A small parcel of ore sent to market from this returned 31 per cent. copper. On a rise, about 6 chains to the N.E., a shaft has been sunk and some excavations made on a copper-carrying formation, which is probably a continuation of the lode at the W. workings. Small parcels of very rich ore have been obtained from both places at various times, and prospects warrant a systematic and careful trial. Copper stains are seen on the rocks at several points in the vicinity, and the surrounding country is well worth prospecting. (D.R. (Gee), 10-9-06.)

WOMBAT COPPER MINE.—This is situated near Kadina, and was discovered through a wombat hole exhibiting carbonate ore. It was eventually incorporated with the Wallaroo Mine property.

WORTHING MINE.—This is situated near Morphett Vale, 16 miles S. from Adelaide. This mine has been abandoned for many years, owing to the hardness of the ground, and because the ore was not found in payable quantities. The lode strikes E. and W., and contains quartz, iron, and copper pyrites. The rocks are clay-slate. There are several shafts, and the pumps are still in the mine. A report reached London in 1859 that the ore from this mine averaged 15 per cent. for copper, and rich carbonates and good black and yellow ore were in the mine.

WYACCA MINE.—Locality, section 1, hundred of Basedow. It was worked until 1867. The Government Geologist reported upon this property in 1896, stating that several shafts had been sunk and cuttings made over a considerable area and on various veins of ore. Workings had been recently resumed, and in an underlie shaft a vein of rich copper ore was being stoped out, its thickness being from 1in. to 8in.; but the footwall was well defined, and gave indications of permanency of the vein. The lode underlies 60° to 70° N., and strikes W.S.W. The ore, which is associated with carbonate of iron, calcspar, &c., consists of rich sulphides and oxides. The underlie shaft should be sunk to a greater depth. At the old abandoned workings in the vicinity there are evidences of copper ore having been raised from veins of considerable size in connection with calcareous and siliceous outcrops. The bedrock consists of clay-slates, claystone, calcareous clay-slates, limestone, quartzite, sandstone, &c.

The Government Geologist, in February, 1899, again reported upon this mine, stating that the underlie shaft, 145ft., was connected with a vertical shaft, 120ft., by a crosscut 40ft. long. The walls of the lode are smooth and true, and about 4ft. apart, the copper-bearing portion being on the hanging-wall. In the W. end of the level it is 2ft. 2in. thick, and in the E. end 4in. ; between the two points it varies from 1ft. 6in. to 2ft. The veinstone consists of spathic iron and calcspar richly impregnated with copper pyrites, erubescite, and occasionally oxides. A small parallel vein accompanies the main lode, about 8ft. or 10ft. distant. Drives on the lode at present depth would probably lead to the discovery of payable deposits of ore, and the lode appears likely to continue to a considerable depth. The inclined shaft should be continued, and drives on the course of the lode should also be put in at a deeper level. In that way the mine could be economically developed. A sample taken from the veinstone assayed $26\frac{1}{2}$ per cent. for copper, fine tailings $14\frac{1}{2}$ per cent., and veinstone from the bottom of the shaft $10\frac{1}{2}$ per cent. About 1,000ft. away S. 14° E. another shaft has been sunk on the lode formation of considerable width in places, with a good footwall. Bunches of good copper ore occur in a ferruginous and calcareous lode, striking N. 85° E., and dipping N. 56° . The shafts are 40ft. and 60ft. deep respectively, and copper ore has been traced 600ft. along the strike. There should be deeper sinking and crosscuts to prospect this lode.

WORTURPA (McLEISH'S).—Situated in the Illinawortina Pound. On the hill, above the old workings, a pit 9ft. deep has been sunk on a new lode, which strikes N. and S. and dips at 65° to the E. It consists of ferruginous quartz, siliceous ironstone, ferruginous copper ore, with malachite and azurite. The copper-bearing portion of the lode is 6in. thick at the surface and 2ft. 6in. at the bottom ; neither wall of the lode is exposed. An average sample from the bottom assayed—gold, 3dwts. ; silver, 17ozs. ; and copper, $17\frac{1}{2}$ per cent. (5-7-01.)

YALPOODNIE MINE.—Situated in the neighborhood of Franklin Harbor. One shaft was sunk to about 20 fathoms, but no work has been done upon the mine for many years. Prospecting operations have been recently resumed. (31-12-06.)

YATTAGOLINGA COPPER AND LEAD MINE.—At Rapid Bay a lead and copper mine was discovered and purchased by Mr. H. W. Phillips, in February, 1844. The lodes of lead are close to the surface and are easily worked. The produce was 75 per cent. lead and from 22ozs. to 25ozs. silver per ton. The copper lodes were found cropping out on the surface and showing also in the face of the cliffs fronting the sea, at a depth of 400ft. or 500ft. from the top. The ores consisted of grey, yellow, and peacock ores. About 50 tons of silver-lead ore were raised. The workings were stopped partly from want of proper superintendence and partly because Messrs. Phillips gave up a station which they had held in the neighborhood. The ground is rather hard, but the situation cannot be surpassed for the facilities which it affords for dressing and shipping away the ore, a stream of water constantly running through the valley at the foot of the mine. Some fine white marble is found on this and the adjoining land. There are also other mineral deposits in the neighborhood. (Austin, 1863.)

YELDA MINE.—This is one of the Yudnamutana group of mines. A fine regular lode is visible for nearly 300yds., running S.E. by E. There are also two secondary lodes running parallel to the main lode. (Austin, 1863.)

YELTA COPPER MINE.—Formerly, for some years, worked with success, and at present (1899) comprised in the Moonta Mine properties. In 1891 the Inspector of Mines examined the property, which he described as adjacent to Moonta Mine, on its N. side, and comprising seven 80-acre sections. The mine being full of water, he was indebted to Captains R. Cowling and Nancarrow for information. The trial shaft had been sunk 156ft. on the course of the middle lode, within a few chains of the Moonta boundary. The lode was well defined, and had yielded small quantities of rich ore. At a short distance N. Scott's shaft had been sunk 338ft. on the course of Wearing's lode. This shaft was started about 1864, and hundreds of tons of ore

had been hauled from it during the 10 or 12 years of its continuous working. Close to Scott's is the old working shaft known as Wearing's, used for ventilation. Hughes's shaft had been sunk at about 600ft. N. of Scott's to a depth of 180ft., for the most part on the course of the lode. Good ore in fair quantity had been raised from these workings. E. of Hughes's a shaft had been put down 240ft. on Hancock's lode; and Lindsay's shaft was sunk to a depth of 60ft., a short distance N. of the last-mentioned sinking, but was then discontinued owing to the inflow of water. N.E. Wright's shaft was put down 540ft., 90ft. vertical, the remainder following the dip of the lode. Chamber's shaft was sunk 180ft., and the Office shaft 420ft., and holed to Wright's at different levels. The Tank shaft had been sunk 240ft.; and Tuxford's 240ft., 60ft. vertical, and then following the dip of the lode; and Wyley's shaft 90ft., the latter being discontinued because of the influx of water. The ore from Wright's and adjoining shafts is refractory, consisting of magnetite and chalcopyrite, which cannot be dressed by ordinary treatment; but thousands of tons were ready for stoping. The mine was, in the opinion of the Inspector, worthy of being vigorously worked, as the Moonta Mine lodes should pass through the property. It is stated that the mine has been acquired by English capitalists; and arrangements are now in progress for forking the water and carrying on the workings. (1899 edition.)

The Inspector of Mines (Mr. W. H. Matthews) visited the mine in December, 1902. No work had been done for a considerable time, beyond keeping the mine clear of water. The manager, Captain Cowling, informed the inspector that the main shaft has been sunk to a depth of 720ft., the lode in the bottom being fully 5ft. wide, of an average value of $5\frac{1}{2}$ per cent. copper per ton, and that no stoping had been done below the 540ft. level; beneath this about 600ft. of drives and winzes have been made, preparatory to stoping. There are large quantities of various classes of ore on the surface that can be treated eventually. The inspector considers the property a valuable one, and mentions that molybdenite shows freely in the main ore dumps. (I.M.R., 13-12-02.)

This property has been acquired by a French company, and is worked in conjunction with the Paramatta Mine.

Later the Inspector reports that work is being vigorously proceeded with; about 300 men are employed on the surface and underground works. The main shaft has now reached a total depth of 244 fathoms, with drives N. and S. opened out at the 55, 65, 79, 90, 106, 120, 140, and 160 fathom levels, with winzes connecting from one to the other, except the latter, which will shortly be accomplished, as rising and sinking from the 140 and the 160 fathom levels are in progress for that purpose. From each level below the 79-fathom drive, there are large quantities of ore available for stoping, apparently of similar value to that being treated. The lode ranges from 4ft. to 8ft., giving probably an average of 6ft. in width. The main shoot of ore in the upper levels is 150ft. long, and at the 140-fathom level is fully 200ft. in length, showing that as the lode continues down each level leaves a larger quantity of ore available for extraction. The character of the ore raised is similar to the other mines in that locality, with the exception of a much larger quantity of iron, which is suitable for flux in the smelting operations. The copper contents of the crude ore raised is from 3 per cent. to 4 per cent.; by hand-sorting and the aid of machinery, this is increased to about 6 per cent.; it is then passed through the smelting furnace, returning about 8 tons of matte per day of an average value of 30 per cent. copper. From 50 per cent. to 60 per cent. of the ore is sent direct to the smelter, the balance, or portions which contain more than the average quantity of silica, is taken to the Paramatta works, and concentrated previous to smelting operations. Portions of the lode contain small deposits of molybdenite, which, so far as possible, is kept separate from the other material, and realised on in its crude state. The principal machinery consists of a double-cylinder winding engine, pumping plant, air compressor for rock drills, blast furnace, small sorting plant, tram roads, and the usual necessary appliances for the economical working of the

mine. Judging from the quantity of ore available in the upper levels, and general appearance of the lower, there is every probability of the mine continuing to yield good returns. (I.M.R., 31-1-05.) (See also PARAMATTA, page 111.)

YOOTOOMOOKINA MINE.—Situated 16 miles E. from Blinman. It has a N. and S. lode of copper traceable for nearly a mile. It is about 5ft. wide, carrying good ore 15in. thick. The underlie is W. about 1ft. in the fathom. (Austin, 1863.)

YORKE VALLEY (formerly "Maitland Copper Mine").—About 4 miles N.E. from Maitland, Yorke Peninsula. The secretary reported that blue and green carbonates found on the surface led to a shaft being sunk on the dip of the lode, which is 4ft. wide, yielding grey and yellow ore. (1890 edition.)

Recently operations, to a certain extent, have been restarted on the property, and it is proposed to test the ground at depth by a diamond drill.

YUDNAMUTANA.—Situated about 70 miles S. of E. of Farina. In commencing his report on this place, Professor Ulrich says:—"The district in which these mines are situated, i.e., amongst the northern spurs of the Yudnamutana Range, is both physically and geologically the most interesting I have visited on my northern trip and, I may in advance mention, presents abundant indications of mineral deposits outside those already opened; in fact, it has not only the aspect of, but possesses also, certain geological characteristics generally found in rich mineral country. Its features are along the S. part—though on a small scale—wildly Alpine in character, presenting bare, brown-looking, precipitous mountains and broken spurs, studded with fanciful cliffs and peaks, divided by narrow rifts and gorges, whilst, in picturesque contrast, tower gently sloping hills; and less broken ranges, covered with a coarse vegetation, succeed towards the N. As regards the geological interest attaching to the district, and which embraces the conditions by analogy favorable for mineral riches, it lies in the presence of an intrusive rock—a peculiar kind of greenstone—with metamorphic concomitants of great variety in texture and mineral character."

The following information has been condensed from the report:—"The chief and most developed ore deposit is a so-called "contact lode." It runs within the boundary of the intrusive rock on the E. and the accompanying metamorphic schists on the W., lying in places between the two or traversing one, sometimes the other, rock in its course. Its mean strike is N. 10° W. and its dip E. at 70° to 80°, whilst the metamorphic rocks adjoining strike N. 40° to 45° W. and dip S.W. at 60° to 70°. The lode seems to have varied from 2ft. to 15ft. in thickness, and has been traced S., from the top of the hill to close upon 20 chains in length. At the furthest point S. a vertical shaft has been sunk about 50ft. deep. The ore produced from this was very poor, consisting of brown jaspery quartz, full of veins and patches of micaceous iron and ochrey-brown iron ore, with many scattered green stains and coatings in hollows and joints. Nine chains N. from this shaft is a whim shaft sunk beneath the water-level. Ore raised from this shows for the greater part a kind of breccia, composed of brown jaspery-looking ferruginous limestone, brown iron ore, and chrysocolla, associated with malachite and occasionally azurite. Of sulphide ore no traces were observable. Besides fine pieces of malachite and chrysocolla there were some smaller ones of reddish-grey oxide, which would indicate that the ore from this portion of the lode was of very good quality. From an excavation on top of the hill a large quantity of rich ore—silicate, carbonates, and oxides of copper—was obtained. The W. wall of this pit consists of metamorphic slates striking N.W. and dipping S.W. at 65°; the E. one of massive greenstone, showing here and there small protruding bosses of a syenitic character. The lode shows in the N. face of the pit, but is thin and apparently very poor, and continues so on the surface. In open workings and in a tunnel close by the ore was of a similar character. Judging from the appearance of the district there is no reason why gold should not exist and be found, both in the reefs and the creeks, if properly prospected for. (Gold was found later, both here and at Wallace's Gully, near the Wheal Frost. See under "GOLD.")

Professor Ulrich, in concluding, remarks :—" From the positions and size of the workings and nature of the ore along the line of the main lode, as just described, it must be concluded that, as far at least as its surface portion is concerned, the latter is not uniformly well-developed throughout, but consists of a series of bunches of larger and smaller size, and probably also of variable richness. On account of the whim shaft being full of water, and the absence of all conveniences for descending the other workings, I was not able to ascertain the nature of the lode in depth, and can therefore not offer an opinion as to its future prospects ; but so much I may venture to say, that, although its character as a ' contact lode ' renders it on the one hand subject to irregularities in thickness, strike, and dip, it is, on the other hand, favorable for its permanence in depth, as experienced in lodes of the same kind in other mining countries ; and as long as the lode continues there is, of course, chance for ore. According to Captain Terrell (formerly manager of the mine) a fine vein of rich green ore (probably chrysocolla and malachite) exists in the bottom of the whim shaft, and similar payable ore was also left in the deepest parts of the hill workings, intended to be opened up from the latter. As this ore will no doubt change in depth to sulphide, the large quantity of micaceous iron at present accompanying it would certainly cause some trouble in dressing. Captain Terrell observed, however, that this undesirable associate decreases gradually in depth." (Ulrich, 1872.)

Mr. Vinrace Lawrence, who was secretary of the company from 1865 to 1873, kindly informs us that three huge blocks of ore weighing 4 tons, $2\frac{1}{4}$ tons, and 2 tons were exhibited at the International Exhibition in London in 1862. Immediately after the break up of the drought, 900 tons, which had been raised prior to the drought (300 tons of which averaged 50 per cent.), was carted down to the Blinman and formed part of £40,046—produce of the two mines (Yudnamutana and Blinman) realised up to February, 1867.

Inspector Matthews reports :—During the time of active operations a large quantity of copper ore was raised, but for some years all underground works have been suspended, and, consequently, the surface workings only could be examined. The strike of the lode, which ranges in width from 2ft. to 16ft., is N. 10° W., and has been worked on the surface for about 20 chains in length. The largest deposit of ore, consisting of carbonates and oxides of copper, was obtained from an opening on the top of the rise. A main shaft, with whim, has been sunk below water-level, the ore raised consisting of brown quartz, with veins and bunches of micaceous iron, containing green copper stains. Men were then engaged dressing up to 25 per cent. the old material, previously left in the dumps from various parts of the mine. They had sent away about 30 tons, and about 10 tons more was ready for transit. Although the property could not be thoroughly examined, yet, judging from the large quantity of ore previously raised, and the continuous lode formation, which has every appearance of permanency, the mine is considered well worth opening up. (I.M.R., July, 1899.)

Departmental reports furnish the following information :—Opened up originally in the early sixties, and after a few years' work operations ceased, and the mine was abandoned and remained so until 1897, when it was again taken up and the old ore dumps and spoil heaps were picked over and a little desultory prospecting done. Lately (report of October, 1901) the property has been taken over by a small working syndicate. The old workings consist of four shafts, from three of which drives of various lengths were put in, and in two of the shafts stoping was carried on. Two open cuts were put down and winzes sunk in each, and a considerable amount of surface costeaning and trenching done. One of the shafts, known as Whim shaft, was sunk 73ft., and met with good water at 58ft. from the surface. It is stated that near the bottom of this shaft drives have been put in for 150ft. N. and 300ft. S. The other three shafts are in bad condition, and depths not obtainable. The open cuts, through the rotting of the timber and being unworked so long, had become mullocked up by the sides falling in. The larger of these open cuts has been

cleaned out by the present holders, and shows 78ft. long, with an average width at surface of 21ft., and 44ft. deep for 38ft. in length. Two trenches, 12ft. and 38ft. in length, are respectively 7ft. 6in. and 14ft. 6in. above the level of the bottom of the open cut. These are being cut down, preparatory to deeper sinking. The ore-body in the bottom of the open cut is 8ft. 9in. thick, and consists principally of cleaved and jointed slate, with a little chlorite, and carries irregular veins and bunches, from a few inches to 2ft. thick, of ferruginous copper ore, grey ore, carbonates, and cupriferos gossan associated with micaceous iron. The lode has a general strike N. and S., with a nearly vertical underlie E. In the open cut, the hanging-wall, described by Professor Ulrich as massive greenstone, is well defined, but the footwall is very rough and broken, and small branch veins of micaceous iron, carrying a little copper ore, strike through it diagonally. On the Pinnacles block an outcrop, over 40ft. in thickness, strikes W. 25° N. and appears to underlie to the N.; it consists principally of quartzite, and contains siliceous and jasper ironstone, hornblende, calcspar, and spathic iron, with crystals of magnetic and other iron oxides. The whole formation is heavily stained in patches with carbonate of copper, and grey ore, copper carbonates, and copper sulphide occur in veins, strings, and bunches. Several small pits have been sunk, and a tunnel along the lode has been started at the E. end of the outcrop, about 40ft. below the summit. Three picked samples gave on assay a little gold and from 8½ per cent. to 16½ per cent. of copper. The preceding holders obtained about 133 tons of payable ore from the ore dumps and spoil heaps, and the present holders have raised about 100 tons, mostly from the large open cut. (George, 16-10-01.)

At the Pinnacles block a tunnel has been driven W. 21ft. and then W. 15° N. for 15ft., and at the end a pit sunk 9ft., opening on a vein of siliceous and ferruginous calcite, containing veins of green asbestos through which are scattered small lumps of copper glance, copper pyrites, and iron pyrites, with copper carbonate stains and iron gossan. The vein-stone is not well defined, but appears to be about 3ft. thick, strikes W. 15° N., and has a vertical dip. These workings are situated about 30ft. below the level of an outcrop of ferruginous quartzite, striking F. and W. and more or less heavily stained with green carbonates. At the Yuda main workings the open cut has been cleaned out and carried down to a depth of from 55ft. to 70ft. from surface, for a length of 74ft., with an average width of 11ft. The worked-out ground above had been partly timbered up and filled with mullock, but the timber (creek gum) proved to be brittle and unable to stand the transverse strain, and unfortunately collapsed. The cut was again being cleaned out and securely timbered. Tributers have taken out ore from shallow levels in the water shaft, and a small parcel of ore was obtained from an old shaft about 300ft. north of the open cut. Work was being concentrated at the open cut. (George, 25-4-04.) The mine has now been taken over by the Union Copper Mining Company of London.

The following list comprises a number of prospects, claims, and mines which have been more or less worked, some of them very early in the history of the State, but respecting which little (if any) information is obtainable:—

AGERY MINE.—About 12 miles S.E. from Moonta.

ANGASTON.—Valley of River Gawler, two copper lodes, one traced for 200yds. Samples said to assay 33 per cent. copper. (Prior to 1846.)

ALL NATIONS MINE.—Situated near the Burra. Worked by a Melbourne company about 1867.

ANSTEY'S MINE (MURKURTA).—Highercombe, near Adelaide. The ore existed in bunches in a gossany lode 2ft. to 4ft. wide, and was being worked in 1846.

BEWLEY MINE.—Situated W. of Waukaringa.

BLACK MARIA.—Locality, 1 mile S. from Boolcoomata Station.

BLACK NOB.—Arkaba.

BURNT PUSSY CLAIM.—Section 200, hundred of Coglin.

CALEDONIA.—Near Hawker.

CARTAPO.—Hundred Ayers.

DUCER'S SLIDING ROCK.—Two mineral claims adjoining the old Sliding Rock Mine.

EAST PARINGA.—Near the Paringa Mine, Callington district.

ELATINA MINE.—Situatd S.W. from Mount Emily.

FINNISS.—Situation, 4 miles from FinniSS Railway Station, where a discovery of malleable copper was made in July, 1869.

FLAXMAN'S VALLEY MINE.—Situatd 38 miles N.E. from Adelaide.

FROME COPPER MINING SYNDICATE.—Three mineral leases, situatd 3 miles S. of Allioota, on the Angepena sheeprun, near Beltana.

GRAND JUNCTION MINE.—Situatd 45 miles N.E. from Adelaide; worked in 1867.

GREAT BRADFORD MINE.—Situatd $4\frac{1}{2}$ miles from FinniSS Flat.

HAILLETT'S MINE.—Situatd within 2 miles from Reynella.

HAMLEY EXTENDED.—Situatd near Moonta.

HART'S MINE.—Situatd S. of Ardrossan.

HORSESHOE VENTURE.—Situatd on the Onkaparinga River.

MAGILL MINE.—Opened in 1846, and worked a short time.

MORPHETT'S MINE.—Situatd 51 miles N.E. from Adelaide; worked about 1867.

MORTLOCK'S MINE.—Situatd near the Burrawing, Tumby Bay.

MOUNT LOFTY COPPER MINING SYNDICATE.—Prospectors held an area of 80 acres, taken up for mining.

MUSGRAVE MINE.—This was a prospecting venture adjoining the Moonta Consols.

NEW HECLA COPPER MINING SYNDICATE.—Locality, North Rhine.

NORTH BRITAIN.—Locality, N. of Port Wallaroo.

PINE HUT MINE.—Situatd 50 miles N.E. from Adelaide.

PRINCE ALBERT COPPER MINE.—Near Moonta.

PRINCE ALBERT'S MINE.—Locality, 9 miles E.N.E. from Adelaide.

ROYAL MINE.—An unsuccessful mining venture in the Moonta district.

SHEAOAK LOG.—An old copper mine was worked, situatd about $3\frac{1}{2}$ miles E.S.E. from this place.

SOD HUT MINE.—Near the Burra.

TORRENS RIVER MINE.—A copper venture on section 5536.

VICTORIA MINE.—Locality, near Moonta.

WAUKALOO MINE.—Situatd 7 miles N.E. from the Boolcoomata Mine.

WHEAL ACRAMAN.—Ten miles E.N.E. from Adelaide, near the Montacute Mine (1854).

WHEAL ALFRED.—Situatd 10 miles E.S.E. from Keyneton.

WHEAL BARTON.—Situatd near Angaston.

WHEAL BESSIE.—Near the Port Lincoln Syndicate's workings.

WHEAL GOYDER.—This was situatd near the Paramatta Mine, and stopped working about 1874.

WHEAL HARMONY.—Situatd 25 miles E. from Adelaide.

WHEAL MARY MINE.—Locality, 25 miles E.S.E. from Adelaide; worked in 1864.

WHEAL VIRGIN.—Situatd S.W. from Davenport Siding.

WHEAL WILLIAM.—Situatd 10 miles E.S.E. from Keyneton.

WILLOW COPPER MINING SYNDICATE.—Six mineral blocks were held by this syndicate at Cradock, hundred of Yednalue.

WILLOW CREEK MINE.—Situatd N. of the Napoleon Mine.

WONGA WONGA.—Situated 25 miles E.S.E. from Adelaide.

The subjoined list is from the official return made of the copper mines which were in existence in 1869 :—

Adelaide, Bon Accord, *Bremer Mines, *Burra Burra, *Blinman, *Burrawing, *Caterpo, Euko, *Daly and Stanley, Dominick, *Hamley, *Kanmantoo, *Kanmantoo West, Kanyaka, *Kapunda North, *Kapunda South, Karkulto, Kinevan, Kanappa, Matta Matta, *Moonta, Mount Chambers, Mount Deception, Mount Emily, Mount McKinlay, Mount Rose, Mount Samuel, Murninnie, *Mount Lyndhurst and Burr, *Mattawarrangala, *Moojoolie, Napoleon, *New Cornwall, North Rhine, *North Yelta, North Wandilta, Nuccaleena, *North-East Moonta, Ooraldana, *Poona, Preamimma, *Paramatta, *Prince Alfred, *Reedy Creek, *Spring Creek, Strathalbyn, *South Wombat, Two Brothers, *Wandilta, *Wallaroo Mines, Welcome, *Wheal James, *Wheal Hughes, Wirrawilka, Wonga Wonga, Wyacca, Windittie, *Yelta, *Yudnamutana, and *Yorke Peninsula Mining Company.

NOTE.—Where an asterisk * is prefixed the mine was at work in 1869.



SILVER-LEAD.

ACLARE.—Situated on section 1296, in the hundreds of Kanmantoo and Strath-albyn, and 3 miles from Callington Railway Station. This mine belonged to, and was worked by, Mr. F. C. Singleton, who furnished, in 1887, the following information:—The property is watered by the Mount Barker and Nairne Creeks. There are nine lodes disclosed in this mine at the present time, bearing N. 10° E., with an E. underlie of 2½ ft. in the fathom; their width varying from 1 ft. to 36 ft. On the surface the ore consists of carbonate of lead and at depth carries gold, silver, nickel, lead, zinc, antimony, iron, and sulphur; and to a depth of 25 ft. the carbonate yielded 50 per cent. of lead and 90 ozs. of silver to the ton. Some recent shipments of ore sent to Europe averaged 52 ozs. silver; and the average percentage of the ore was, from near the surface, lead, 50 per cent., silver, 90 ozs.; from 30 ft. to 114 ft., a little lead, about 40 per cent. of zinc, and silver varying from 60 ozs. to 302 ozs. The veinstone associated with the metallic minerals is principally silica. The value of the ore was variable, but some realised £19 per ton in London. The ore occurs in shoots of carbonates or sulphides, striking S. and dipping 30° E. There are five shafts on the main workings, the deepest of which is 30 fathoms, or 180 ft. Seven drives have been put in to the following distances:—52 fathoms, 35 fathoms, 30 fathoms, 16 fathoms, 11 fathoms, 6 fathoms, and 3 fathoms, a total of 153 fathoms, or 918 ft. Besides the main workings, an adit has been driven for 312 ft. to cut the main lode, but no ore was obtained. Other adits have been driven and shafts sunk, but nothing payable was met with outside the main workings. The Inspector of Mines (Mr. D. D. Rosewarne) reporting upon it in 1889, when not worked, said that carbonate and oxide ores are scarce, and sulphides are found very near the surface. It is a true fissure vein, and increases gradually in width downwards. In the W. end of the 120 ft. level there is a solid body of ore 7 ft. wide, whilst the foot and hanging wall workings show the foundation to be very much wider. Two or three other of the five shafts all disclose the permanency of the lode, and its uniform ore-bearing character. The ore in its present state would be refractory, but the zinc would pay well for extraction. At a subsequent visit the Inspector states that 1 cwt. of samples taken from across the face of the lode at the 120 ft. level returned 6 per cent. of lead, 35 per cent. of zinc, and 32 ozs. 13 dwts. 8 grs. silver per ton. He expressed his conviction that the Aclare Mine is undoubtedly a good one; and since the resumption of working an important improvement, greatly enhancing the value of the property, had occurred. A formation 8 ft. wide of carbonate ore had been discovered in the hanging-wall, which gave on assay 10 per cent. of lead, 58 ozs. silver, and 1 oz. 13 dwts. of gold per ton, with only a trace of zinc; the whole bulk would probably average 50 ozs. per ton. Active work was being carried on at the mine, and other prospects were being opened in the district. The Aclare Mine had, in 1890, become the property of the Kangarilla Company, a proprietary formed in England, by whom it was worked for a year, when mining ceased. In March 1900, Mr. Inspector Matthews furnished the following report:—The works are close to Scott's Creek, and surrounded by hills, reaching to a considerable height above the level of the watercourses. There are various shafts and workings throughout the property, but, with the exception of the main lode, nothing of importance has been struck. This lode has been worked principally by a main shaft and a tunnel; the former has been sunk to a depth of 260 ft., the first 100 ft. being vertical and the remainder on the lode underlie. Near this shaft on the surface an open cut, 6 ft. to 8 ft. wide, has been made on the lode, which strikes N. 10° E. with an E. underlie of about 1 in 3. The ore extracted to the 60 ft. level consisted chiefly of carbonate of lead, giving a high percentage of lead and silver. It was stated that from this level 1,200 tons of an average value of 45 ozs. of silver per ton had been disposed of. At the foot of the hill a tunnel has been driven 1,000 ft., the first 800 ft. being in country rock. The lode was then intersected and driven on for a

further distance of 200ft., disclosing a shoot of ore from 80ft. to 120ft. in length, dipping S., a continuation of the ore worked from the surface. The lode matter is fully 7ft. wide, associated with a number of metallic minerals, the principal being lead, silver, and zinc. The others, which occur to a small extent, are gold, nickel, and antimony. The walls are well defined and are composed chiefly of micaceous schist. Below the tunnel-level several winzes have been sunk to the depth of 120ft., the lode maintaining the same size. The stopes contain large blocks of ore still to be extracted, and the last parcel sent to England returned an average value of lead 10 per cent., zinc 25 per cent., and silver 30ozs. per ton; but as the main ore body is below the level of the tunnel, the work of hauling the material by manual labor is too expensive, and the proper course to adopt would be to sink a main vertical shaft considerably S. of the present workings, with the object of cutting the main shoot of ore at about the 500ft. level. By means of this a large amount of unexplored ground would be opened up, and the working of the present stopes facilitated. The actual present value of these stopes in bulk should, of course, first be proved by raising small parcels of ore at various points. (I.M.R., 13-3-00.)

ACLARE NORTH.—This property adjoins the Aclare Mine, and a good deal of work was done in sinking trial shafts and driving a tunnel on the course of a not very productive lode outcropping in a hill by the side of a creek.

ALMANDA (first known as the "Wheal Maria").—Situated about 18 miles S.E. from Adelaide. It was opened in 1850 and worked as a copper mine, but not being productive at a shallow depth, work ceased. In 1866 the mine was examined, and from assays made of some stones left on the surface it was found to be poor in copper but rich in silver. Seven samples assayed gave from 44ozs. to 115ozs. of silver to the ton of ore; five other samples yielded from 25ozs. to 75ozs. of silver to the ton, and three samples assayed elsewhere gave from 30ozs. to 75ozs. of silver per ton. In 1868 a mineral claim (No. 2759) was taken out, and 4 tons 8cwts. of ore, crushed in a Chilian mill in June, yielded about 28ozs. to the ton. Later on amalgamating pans were tried, and by this process some 6,000ozs. of silver were produced. In 1870 fresh assays from various parts of the mine were made, and yielded results of from 57ozs. to 66ozs. silver to the ton, and about 5 per cent. of copper. At a depth of 16 fathoms in the engine shaft the lode assumed a hard character and contained barytes, quartz, silver ore, arsenic, &c. In 1877 the engine shaft was sunk to a depth of 21 fathoms, and assays from stone raised gave—silver, from 88ozs. to 163ozs. per ton; gold, 1oz. 13dwts. per ton; copper, from $7\frac{1}{2}$ per cent. to 16 per cent.; and from the W. drive, off the engine shaft, 40ozs. of silver to the ton, and $4\frac{1}{2}$ per cent. of copper. In 1881 the winze in Ey's tunnel was sunk to a depth of 76 fathoms, but the water came in too strongly to be kept under by hand labor. Assays gave 17ozs. silver to the ton, and 16dwts. 8grs. of gold. The workings consist of two shafts of 21 fathoms and 16 fathoms, and a winze in Ey's tunnel, sunk to a depth of 76 fathoms. There are also two tunnels of 40 fathoms and 20 fathoms each, a dam, various buildings, a furnace, two large Cornish boilers, a horizontal engine, &c. The mine is not now being worked. (1887 edition.)

The Inspector of Mines, in November, 1900, reports:—Mineral lease 1022, in hundred of Noarlunga. The mine was inspected, but could not be fully examined underground owing to poor state of repair, resulting from lengthy abandonment. From the material on the surface, which probably came from the bottom of the shaft, the lode is very hard and is composed chiefly of quartz and barytes, a sample from which gave a return of 1oz. 13dwts. of silver and $1\frac{1}{2}$ per cent. of copper per ton, whilst assays from a ferruginous lode formation 6ft. wide, in an open cut, which was apparently of very promising character, only gave from 2ozs. 13dwts. to 5ozs. of silver per ton. Samples from the ore dumps gave a return of 71ozs. 10dwts. of silver and 1 per cent. of copper per ton. This result shows that, in some part of the workings, ore of fair silver value exists; but, owing to the work having been so long discontinued, it is impossible to say at what depth or to what extent. (I.M.R., November, 1900.)

AVONDALE.—Situated about 2 miles S.W. from Mount Lyndhurst Trig. Hill, and 15 miles from the railway station. Four or more well-defined parallel lodes of almost pure galena, without any vein stuff, traverse the strike at right angles, of jointed and cloven beds of quartzite, argillaceous slaty shale, and schist. Only two have been worked. The lodes vary in width from a few inches to over 2ft. (later reports give the width as 3ft. to 5ft.); they strike N. and S. with a high W. dip. A shaft has been sunk to a depth of 100ft., and the galena is still visible in quantity, both in the shaft and in the outcroppings along the surface. Assays of five samples of ore from this mine made by the Government Assayer resulted as follows:—

No. 1	77	per cent. lead, and	5ozs. 14dwts. 8grs.	silver per ton.
No. 2	73	“ “	4ozs. 18dwts.	“
No. 3 (gossan). 21	“	“	7ozs. 7dwts.	“
No. 4	67	“ “	4ozs. 14dwts. 7grs.	“
No. 5	72	“ “	8ozs. 1gr.	“

The ore is easily raised, and a large quantity was sent to London, but the results were not considered payable. T. A. Masey (1890) furnished the following particulars:—Several hundred tons of galena, assaying from 50 per cent. to 75 per cent. of lead and from 9ozs. to 12ozs. or 15ozs. of silver to the ton, have been raised. The mine was worked some time back, and presumably profitably, and has now again been taken up with a view of being vigorously developed, as the ore could be sold at a profit as a flux to the smelting works. Several tons of ore are being forwarded to England for treatment under a new alkaline reduction process. The ore showing in one of the lodes at about 15ft. from the surface would yield 4 tons of 75 per cent. galena to the fathom, and would require very little dressing. The Inspector of Mines reported in 1890 that an underlie shaft had been sunk 70ft. on small veins of galena of uncertain character, striking N. and S., with a sharp dip W. Some stoping had been done, and some shallow holes sunk near to each other and to the underlie, from which a considerable quantity of ore had been raised. There are several outcrops that have the appearance of being caps of lodes. In 1892 he gave another report after an inspection; at that date very little work had been done in the previous two years. There should be further prospecting.

Inspector Matthews reports in August, 1899—At the time of inspection operations were being restarted after the property had been unworked for 13 years, and the underground workings could not be examined. It was stated that in the past a large quantity of ore had been raised, averaging 13ozs. silver and 50 per cent. of lead per ton. There are three lodes on the property. The E. lode is 2ft. 6in. wide; it carries carbonate of lead on the surface, changing into iron gossan as it goes down. The W. lode has been worked for the distance of 1 chain in length on the surface, and the quality of the material raised is of very low grade. The middle lode is about 2ft. 6in. wide, and a shaft has been sunk to the depth of 140ft.; the material from the bottom is chiefly ironstone gossan, containing lead in the form of carbonates and lead crystals. A sample of this yielded, on assay, gold, a trace; silver, 1oz. 4dwts.; copper, nil; and lead, 20 per cent. (I.M.R., 3-8-99.)

A Queensland company worked the mine for some time, and marketed a considerable quantity of high-grade silver-lead ore. Operations were discontinued about four years ago, and since that time only desultory work and ore-picking from the dumps, &c., have been in progress (1907).

BARATTA.—Situated near the Baratta Springs, about 10 miles W. from Eukaby. At the time of the Government Geologist's examination (1888) a shaft was being sunk to prospect an outcrop of brown iron ore and ferruginous strata near the junction of a mass of crystalline limestone with kaolinised slates. Samples of the surface ore were said to have yielded good silver assays. He was of opinion, from the nature of the outcrop, that a lode containing silver was not likely to be found.

At a later period the Inspector of Mines reported that there were several iron "blows" at the foot of a big hill, improperly supposed to be the outcrop of a lode. Two shafts had been sunk, and a crosscut put in, but nothing of value was found. The further expenditure of capital in mining upon this place, he said, would be sheer waste. (1889.)

BARRITT'S MINE.—First worked in 1862. Situated about $1\frac{1}{2}$ miles from Normanville. The lode was found to run E. and W., and was about 12in. wide, underlying N. about 3ft. in 40ft. The silver-lead was in yellowish clay, and the ore contained about 60 per cent. of lead, and from 3ozs. to 5ozs. of silver to the ton. About 25 tons of ore were raised when first the mine was worked. It has been worked in later years by various people, but there are no available records of results. The ore was valued at £10 per ton in London, but the buyers complained of the way in which it had been dressed. One shaft was put down to a depth of 70ft., but the water-level was not reached. A drive of about 8 fathoms was put in. The ore occurred in blocks of almost pure galena, weighing as much as 2cwts. each, also in large crevices and in loose blocks. The lode ran from the surface to the bottom of the shaft. (1887.)

BASHAM'S.—An iron "blow" outcropping through the alluvial on Basham's property, close to Port Elliot, formerly quarried for road metal, contained traces of silver and copper. The Inspector of Mines expressed the opinion that the junction of the granite with the clayslate being a favoring circumstance, there was encouragement to prospect the locality. Assays of samples he took from the ground gave 4ozs. 9dwts. of silver to the ton. (1889.)

The Inspector of Mines reported in September, 1890, that two shafts had been sunk, one of which had fallen in; the other was 40ft. deep. There are boulders of ferruginous sandstone, covered by a layer of limestone, which had been mistaken for a lode, but samples gave no return of silver.

BELTANA MINE.—This lies among low ranges about 18 mile W. of Beltana Station, and half-way between the S. end of the Mount Deception Range and Lake Torrens. The ore deposit is represented by a thin zone of soft arenaceous shales impregnated with and enclosing small patches and nodular pieces of atacamite. The deposit dips apparently at an angle of 20° to 25° N. underneath a thick bed of hard limestone forming the flat top of a low hill. The workings lying on the S. slope of this hill are distributed over a length of about 100ft. and consist of four openings, two of which are mere shallow excavations, and the third an underlie shaft of about 16ft. deep, with a crossdrive. The fourth is also an underlie shaft about 60ft. in depth. The shales exposed are very soft and full of streaks and concretionary masses of impure brown iron ore, with seams and cavities full of crystalline coatings of atacamite. Besides these, small patches and veins of gypsum occur, and angular irregular masses of cavernous quartz, the hollows of which are mostly occupied by atacamite in fine acicular crystals, associated occasionally with carbonate of lead. (Ulrich, 1872.)

It was later known as the "Beltana Broken Hill," and visited by the Government Geologist in April, 1888. The workings included a tunnel driven 60ft. through kaolinised slate and sandstone in close proximity to the old mine. There was no lode visible, but segregations of ore were found embedded in the rock. There was an outcrop containing gypsum and manganese, and iron "blows" occurred in the same class of rock. Though a lode had not been found, yet larger deposits might occur and might furnish means of discovering one. The amount of ore showing in the tunnel and along the outcrop of the soft shales in the neighborhood offers sufficient inducement for a thorough prospecting of the locality. Two average samples taken from the tunnel yielded silver to the extent of 2ozs. 18dwts. 19grs. per ton, with 41 per cent. and $32\frac{1}{2}$ per cent. of lead; and a sample procured by the manager gave 3ozs. 15dwts. 3grs. of silver per ton and 47 per cent. of lead, with a trace of gold.

Afterwards (renamed the "Warrioota Silver Mine") it was examined in 1892 by the Inspector of Mines, who reported that when worked by the Beltana Broken Hill Company the outcrop of the lode along the face of the hill was stripped for a distance of 300ft.; Lewis's tunnel was driven E. 150ft., and winzes and drives were put in. There is a large formation composed of calcareous sandy clay covered by crystalline limestone. Small ferruginous sandstone veins traverse the formation, which also carries small quantities of cerussite of no value. The old workings do not show anything payable. In another tunnel more ore is present, and very fair patches of galena. Samples taken assayed 20ozs. 8dwts. of silver per ton and 52½ per cent. of lead. Exploration should, in the opinion of the Inspector, be continued.

Recently the place has been known as the "Beltana Blocks," and has been worked intermittently. Returns show that in 1903, 740 tons of ore were treated for 40 per cent. lead, 10ozs. silver per ton, and a little gold and copper.

BELTANA NORTH (Claims 11997-9).—At the time of the visit of the Government Geologist, in April, 1888, costeaning was being done to a small extent in hard crystalline limestone, in which a few specks of galena were occasionally seen. At a more recent period the Inspector of Mines examined the property, and found that an endeavor was being made to cut the Ediacara lode, and he was of opinion that the vertical shaft put down must have passed through it and into the footwall. The course of the lode is W. 10° S., and the dip S. 20° E. He considered that the prospects of the Ediacara Mine justified prospecting on this property. (1889.)

BELVIDERE.—Situated in the hundred of Gilbert, 5 miles E. of Riverton. The mine was worked in 1849, but there is no record of any work having been done from 1853. There are two shafts on the course of the lode about 450ft. apart. A lenticular shoot of ore must have been taken out. The Inspector of Mines reports that there are still some small patches of lead and copper ore showing in places. The formation is regular and continuous. The lode strikes N. and S., and underlies E. The walls, well-defined, consist of clayslate. An assay of galena taken from this mine gave silver 24ozs. 16dwts. and lead 77 per cent. (1890.) Mining operations have recently been restarted here. (1907.)

BIG HILL.—This mine is situated 2½ miles from the Great Gladstone Silver Mine, and contains a lode of brecciated gossan and iron ore of considerable width, cutting across horizontal clay and calcareous slates. The prospectors reported good assay results; but the samples taken by the Government Geologist returned neither silver nor gold. (1888.)

BILLY SPRINGS (Mount Fitton).—Copper, silver, lead, and zinc, *vide* page 89.

BUTTAMUK.—Hundred of Coglin. Has a strong iron lode in a creek, carrying oxide of iron and large bunches of micaceous iron, from which encouraging assays for silver are said to have been obtained. To prove the lode in settled country, a shaft 105ft. deep has been sunk, and from the bottom a drive W. 26ft. has passed through the footwall of the lode, which runs N.E. and S.W., underlying S.E. The country rock is decomposed, and further sinking is required to prove the value of the sulphides. There is also another iron oxide lode in the property, carrying a small percentage of mundic. Government assay of samples taken showed in siliceous ironstone 4grs. gold to the ton, and from ferruginous quartz 3dwts. of gold to the ton. Further sinking necessary. The Inspector of Mines reported in 1891 that prospects were not encouraging, no settled country having been met with. The sinking has been through a sedimentary deposit, and micaceous iron was the only mineral present.

CAMPBELL'S CREEK. This property is situated about 2 miles E. from Cape Jervis. Lead has been found on the property, but no payable lode cut. The ore found was good, but was not in payable quantities. (Austin, 1863.) It subsequently became a part of the Talisker property. (See "Talisker.")

CARRIETON, EURELIA, ORROROO, BLACK ROCK, COOMOOROO, WALLOWAY, MCGEE SPRINGS, MCCULLOCH, EURILPA.—Several localities near these townships were inspected by the Government Geologist in July, 1886, where shallow shafts had

been sunk on supposed silver lodes. Assays from some of these places are stated to have yielded from 4ozs. to 240ozs. of silver to the ton. After examination of the supposed ore, however, he was forced to conclude that the rich samples of ore sent down from the mines for assay were not taken from the places they were supposed to come from; or, if so taken, were enriched by the addition of silver ore or silver. No permanent, continuous, well-defined lode was seen at any of the claims. In some instances the supposed lodes consisted of bedrock alone.

CHERRY GARDENS.—It was reported that on section 1059, near Mount Malvern, hundred of Noarlunga, samples of ore had been raised, yielding up to 28ozs. of silver per ton. The Inspector of Mines made an examination of the locality (1889), and reported that a small underlie shaft had been sunk to a depth of 17ft. on a quartz lode, which dipped S. In his opinion the prospect did not give indication of the presence of gold or silver. The samples he took gave no return of metal. He did not recommend any further outlay.

CUMANILLA OR CHERRY GARDENS MINE.—Is about 12 miles south of Adelaide. A shaft was sunk about 13 fathoms deep, and the ore raised was said to have contained a good percentage of silver and lead. (1887.)

COROMANDEL SYNDICATE.—The workings are situated $1\frac{1}{2}$ miles from Blackwood Railway Station. The Inspector of Mines reported in 1890 that a small vertical shaft had been sunk 34ft., and at that depth a drive had been put in N.W. 20ft., and a winze sunk in a small clay vein or flucan 36ft. From the bottom of this winze a drive was carried W. 12ft., following a small vein running irregularly through argillaceous slates, and carrying in patches small nodules of galena. There is no lode, nor anything worth further prospecting.

COODLA MOONDA SYNDICATE.—Locality, the seashore, under Newland's Head. The place was worked in 1863 on indications of the presence of silver. In 1890 the Inspector of Mines reported that a pit had been sunk in indurated slate to work a small vein of quartz and galena. He pronounced it to be a small cleavage vein only and not worth following.

DALNOUSIE SYNDICATE.—Situation, Golden Gully, 10 miles N. from Petersburg. The Government Geologist reported rock formation, blue limestone, slate, and sandstone, traversed in places by thin veins of calcite, containing galena and gossan. These have been prospected by shafts and cuttings, which have failed to trace these veins to any lode formation. (1888.) And in March, 1897, that a shaft 70ft. in depth had been sunk on the underlie of a lode formation, consisting of limestone, with iron oxide, gossan, and calcareous matter, which strikes N.E. and dips S.E. at an angle varying from 50° to 70° , and which has a width of from 1ft. to 2ft. The country rocks are clayslate and calcareous clayslate and limestone. No mineral excepting iron ore observable, but he was informed that a little galena had been met with. Silver-lead and galena have been found elsewhere on the section (75) in thin veins of calcite, and in the joints of the limestone rock, but of small value. The rock formation is favorable to the occurrence of metallic minerals.

DALKEY HILL.—Situation, 5 miles S. from the Premier Mine, in the New Luxemburg district. The Inspector of Mines, who examined and reported, stated that two vertical shafts were sunk to strike the lode at a shallow depth. The ground is of a favorable character for carrying plumbiferous lodes. The formation carries galena and partly decomposed sulphide ore, encased in calcareous matter; the balance of the gangue consists of quartzite, schist, and siliceous ironstone. The ore makes in bunches, and dips S. Samples taken assayed 60 per cent. lead and 21ozs. silver to the ton. Further prospecting is warranted. (1889.)

DARK HILL.—Locality, 2 miles S.E. from Giles' Nob, Oulnina Run. There are several quartz reefs and veins, with galena, carbonate of lead, and gossan. Some of these contain but a small percentage of silver-lead; others offer sufficient inducement to cause a thorough prospecting of the locality, as the lodes are wide and well defined. The rock formations consist of micaceous claylathes, calcareous slates, and micaceous schist, with dykes of eruptive granite. Three samples taken assayed

as follows :—(1) carbonate of lead, 19ozs. 4dwts. silver per ton, and 66 per cent. of lead ; (2) galena, 37ozs. 18dwts. silver per ton, and 72 per cent. of lead ; (3) carbonate of lead, 40ozs. 6dwts. silver per ton. On the occasion of a recent visit (1890) the Inspector of Mines arrived at the conclusion that the mine did not warrant further outlay. It was amalgamated with the Prince Albert Silver Mine.

DR. DIXON'S PROSPECTING CLAIMS.—Locality, 2 miles W. of Taltabooka Well. Some prospecting was done on galena veins, associated with quartz reefs. A sample of the galena assayed 17ozs. 6dwts. of silver per ton and 62 per cent. of lead.

DARKE'S PEAK.—In 1895 a trial for silver was made in a mineralised piece of country near Darke's Peak, in the Franklin Harbor district, by Mr. G. Standley, of Yadnarie, and a shaft was put down 40ft. It is stated that an assay showed 33ozs. of silver to the ton.

DAVEY'S.—Section No. 8, hundred of Miltalie, 12 miles N.W. of Franklin Harbor. Two shafts have been sunk, 15ft. and 18ft. ; the latter exposes an ironstone vein 18in. wide, which, towards the bottom, changes into a gossany material, carrying small lead crystals. The second shaft is sunk on a parallel formation 12ft. wide composed of ironstone, gossan, small veins of quartz, and kaolin, having a most favorable appearance for silver and lead, and worthy of further prospecting. (I.M.R., 8-11-99)

DUCK POND HILL.—Near Mount Freeling. Work is in progress here, and small parcels of ore up to 55 per cent. lead and 14ozs. silver per ton have been raised recently. (1907.)

DUNCAN'S.—Sections 603 and 604, hundred of Hanson. The Inspector of Mines reported (April, 1890) that a number of pits had been sunk on two small segregated veins of quartz, carrying small patches of galena ; strike N. and S., with a sharp dip W. Enclosing strata, indurated slates capped with limestone. The deepest sinking was 20ft. vertical, and a small vein of quartz and galena had been followed on its dip 10ft. or 12ft. An assay had yielded 7ozs. of silver per ton and 33 per cent. of lead. A sample assayed by the Government Assayer returned 5ozs. 17dwts. silver and 53 per cent. lead. The veins opened up were too small to be of value.

EDIACARA.—(Note.—*Ediacara, Ediacara Consols, New Ediacara, and New Ediacara Consols* are one and the same mine).—The property is situated on an extensive plateau, 18 miles E. of Beltana. At the time of the Government Geologist's visit in April, 1888, costeaning was being carried on at three places. Galena is disseminated through a bed of crystalline limestone from 1ft. to 2ft. thick, inclining at a low angle E. Another excavation further S. shows a similar deposit, with a lower percentage of galena. The main workings are in a creek still further S. An average sample of the ore yielded on assay 48ozs. 10dwts. 4grs. of silver per ton and 62½ per cent. of lead. It is possible that large deposits of ore in patches may exist, but from the nature of the bedrock their locality and extent will be uncertain. The limestone should be sunk through into the underlying shales to see if the ore continues from one rock formation into the other.

The general prospects of this enterprise justified, in the opinion of the Inspector of Mines (Mr. Rosewarne) the employment of a number of men to open the bodies of ore. The bulk of the ore in sight required dressing machinery. Samples assayed by the Government Assayer gave per ton—(1) galena, 42 per cent. lead and 7ozs. 10dwts. silver ; (2) galena, 52 per cent. lead and 39ozs. 4dwts. silver ; (3) glance, 16 per cent. copper and 342ozs. silver ; (4) galena, 51 per cent. lead and 10ozs. 2dwts. silver ; (5) galena, 52 per cent. and 2ozs. 9dwts. silver ; (6) galena, 63 per cent. and 17ozs. 6dwts. silver ; (7) galena, 52 per cent. and 18ozs. 9dwts. silver. Taking the whole of the exposed bodies of ore, the average bulk would assay 16 per cent. lead and 4ozs. silver to the ton. The ore is in veins lying in the laminations of the strata : in the N. quarry the formation is 3ft. thick, of which 18in. is galena ore, and it dips at an angle of 15°. The copper and silver glance forms not more than 1 per cent. of the bulk of the ore, and it is found in small and irregular bunches here and there along the surface. On a subsequent examination (in 1889) the same official reported that the general prospects of the mine had greatly improved, and

that in the W. shaft, at the depth of 50ft. from the surface, driving had been commenced, and the lode exposed consists of carbonate of lead, argentiferous gossan, and calcite, and occasionally pieces of galena. In the N. shaft or quarry the ore has increased in size, being now 2½ft., and carrying lead throughout. This deposit appears to be making a series of "wallows," the flat portion making ore, whilst in the vertical downthrow the ore is scarce. The prospects of the mine are much brighter, but it will not be brought into a payable condition until the ground is proved systematically. Mr. Dalton, the secretary to the company, stated that subsequently to the above report being written the W. shaft had been sunk a further depth of 50ft., and that chlorides had been found in small quantity. The N. shaft is now called Greenwood's shaft, and here driving and stoping were being carried on. There was lying at grass ore, estimated at 600 to 800 tons, suitable for concentration, that it was thought would dress up to 25ozs. to 30ozs. silver per ton, and 55 to 60 per cent. lead. Actual results by hand-jigging gave 26ozs. silver per ton and 56 per cent. lead. In November, 1890, the Inspector of Mines examined this mine, and reported shafts had been sunk and drives put in, and a considerable quantity of ore could be worked from Greenwood's shaft, where the lode was 5ft. thick. He took samples from all parts of these workings, which upon assay returned 17ozs. 12dwts. of silver per ton and 42 per cent. of lead; the ore could easily be brought by concentration up to 36ozs. of silver per ton. A short distance N.E. from Greenwood's a ventilation shaft, sunk 30ft., cut at 15ft. a lode formation 6ft. wide, carrying silver glance, chlorides of silver, and earthy cerussite, &c., assaying 38ozs. 10dwts. of silver and 37 per cent. lead. The S. quarry workings gave sample assaying 12ozs. silver per ton and 50 per cent. lead. Further S. along the outcroppings galena and copper occur in small patches. The W. shaft has been sunk in disturbed country 100ft. vertically and 10ft. on an underlie E., cutting through a large formation carrying barytes and argillaceous limestone, intermixed with small bunches of calcite and earthy cerussite. Samples from the drives returned 2ozs. 5dwts. of silver and 13 per cent. lead. This mine, with fair treatment, would, in the Inspector's opinion, become dividend-paying.

In May, 1892, the Government Geologist specially reported upon the geology of the Ediacara field. He stated that there are three principal rock formations, the whole forming a basin or synclinal trough. The upper metalliferous deposits occur in dolomitic limestone, and are known locally as the upper lode. The lower metalliferous deposit is contained in an argillaceous shale and sandstone formation, which does not exceed 50ft. or 60ft. in thickness. In the upper lode argentiferous ores, consisting chiefly of galena, carbonate of lead, and iron gossan, occur in a flat brecciated calcareous deposit, and irregular veins extending through fissures in the limestone rock. The deposit is too uncertain to justify expectation of continuous supplies of ore, or of the existence of a large defined lode, although pockets of ore may exist. Assays have proved that portions of the upper lode are extraordinarily rich. The lower ore deposits contain segregations of carbonate of lead, gossan, and ironstone, and carbonate of copper, and do not constitute a true lode. This belt of ore-bearing strata can be traced S. below the limestone escarpment for 2½ miles. This formation may prove to be ore-bearing over a considerable area. Shafts have been put down about 200ft. to prospect for the lower metalliferous deposits, but an influx of water prevented reaching the requisite depth. There is a great probability of a true lode existing beneath the limestone formation all over the synclinal area. By boring or sinking a line of shafts across the basin this area could be fully prospected; and the inclined tunnels in the Warrioota block might be continued. In no part of South Australia do silver-lead deposits occur as they present themselves here, and the prospecting operations suggested are very desirable.

The Inspector of Mines (Mr. Parkes) reported (9-4-92) that a great deal of work had been done here, and that Greenwood's tunnel on the upper lode had been driven 389ft., and other levels had been put in and shafts sunk. Morish's tunnel was in 273ft. on the lower lode. The company holding the leases had expended £25,458,

and were prospecting the property thoroughly: They had received £3,500 from sales of ore. They sought assistance from Government, which they said would not have been needed if the lode had not been "thrown" by a strong fault. The Government Geologist reported at length in May, 1892, explaining the geological features and the characteristics of the metalliferous deposits. He also stated that the workable portion of this deposit had been stoped out in Greenwood's tunnel, and only the thinner portions of the veins remained. Owing to irregular distribution and hardness of the containing rock, prospecting for other deposits would be costly and results uncertain. In the lower ore deposits there are segregations of carbonate of lead, gossan, and ironstone and carbonate of copper; and barytes and calcareous matter are associated with the ore, and in some places quartz and maniferous ironstone veins and gypsum penetrate the deposit to a considerable extent. Near the W. end of Morish's tunnel the argillaceous strata containing the ore have been cut off by a purely local fault running in a N.E. direction, the quartzite being thrown up to a height of 70ft. A lode formation of a more or less vertical nature may be found to exist in the fissure caused by this fault, and other faults may exist beneath the synclinal basin. Assays per ton of samples from the upper lode, Greenwood's tunnel, showed from ferruginous limestone, silver 80ozs. 14dwts.; fahlerz, ironstone, and atacamite, silver 5,881ozs.; fahlerz, ironstone, and cerussite, silver 2,889ozs. 15dwts.; and fahlerz, cerussite, and limestone, silver 520ozs. 14dwts. From the lower lode, Morish's tunnel, ferruginous cerussite, silver 146ozs. per ton and lead 35 per cent.; ferruginous cerussite, silver 199ozs. 12dwts. per ton and lead 36 per cent. These were specimens of the richest veins, average samples not being obtainable, the bulk of the ore having been worked out. An attempt to sell this venture in England proving unsuccessful, and local capital with which to continue working being unobtainable, the company has been wound up voluntarily. This property has been held by three companies since 1890, and it is believed that over £25,000 has been spent upon it in various ways unsuccessfully. It was in liquidation, and possession fell to the Government in consideration of a subsidy granted and rent overdue. (1897.)

On the occasion of an inspection the Government Geologist brought from this mine, in 1897, samples of ores from various depths in the dolomitic formation or upper lode. The samples were free from gangue, not picked. Some of them were from what was known to be a very rich part of the mine. The assay results were—No. 1, 692ozs. 8dwts. silver per ton, 30 per cent. of lead, and 22 per cent. of copper; No. 2, 722ozs. 8dwts. silver, 16.1 per cent. lead, and 37½ per cent. copper; No. 3, 55ozs. silver, 51.1 per cent. lead, and 5½ per cent. copper; No. 4, 169ozs. 12dwts. silver, 43.8 per cent. lead, and 10½ per cent. copper; No. 5, 478ozs. 4dwts. silver, 47.3 per cent. lead, and 10½ per cent. copper; No. 6, 101ozs. 8dwts. silver, 59.6 per cent. lead, and ¾ per cent. copper; No. 7, 79ozs. 18dwts. silver, 61.2 per cent. lead, and ½ per cent. copper; and No. 8, 23ozs. 14dwts. silver, 63.4 per cent. lead, and a trace of copper. Boring operations were being carried on by the Government.

The Inspector of Mines (Mr. W. H. Matthews) reports in December, 1899:—The country rock is principally argillaceous limestone, enclosing, on the W. side of the plateau, veins of silver-lead ores, dipping slightly towards the centre, having every appearance of being a horizontal deposit. A large amount of work has been done, consisting of shafts, drives, and tunnels. Owing to the water the shafts and drives could not be examined. A fair quantity of ore must have been extracted from the tunnels. In the upper one, Greenwood's, which has been driven about 400ft., little remains beyond small veins and bunches of fair-grade ore; not sufficient to work the mine at a profit. There are a number of faults and slides at various points in the workings, which have disturbed the continuity of the vein formations, and doubtless assisted to form the rich pockets of ore that formerly existed, and may again be discovered at the deeper levels, on the opposite side of the faults. The lower tunnel is in about 270ft., and the vein matter exposed is of very low grade, except at one point, where it opened out to 4ft. wide, containing carbonate of lead,

gossan, and ironstone, worth, from a sample taken, 8ozs. of silver and a fair percentage of lead. A drive should be put in on this portion of the vein in order to test its value. At a point about 60 chains S.E. of Greenwood's tunnel a diamond drill bore, then worked by the Government, was in progress, and had reached a depth of 416ft. Open rock was struck at 332ft., allowing the water to escape, and making the drilling slow and expensive. As the various strata are passed through samples are tested for any metal. Some of the assays have been encouraging, but not of sufficient value to warrant the expense of shaft sinking. (I.M.R., 8-12-99.) The boring operations were soon afterwards discontinued. Later the ground was taken up by a local prospector, who obtained good returns from a considerable quantity of readily accessible ore marketed by him. Early in 1907 a syndicate was formed to rework this property, and erect a smelter on the mine.

A report in August, 1907, states—Greenwood shaft.—This has been sunk to a depth of 400ft. on the incline, following the dip of the lode to the E. The lode is 2ft. wide, and consists of carbonate of lead, galena, and ironstone. At 300ft. a fault was cut, which appears to have been an upthrow. The last 100ft. of sinking was done through country rock, and I think it would be advisable to put up a rise about 50ft. past this fault, to prove if the lode continues to go E. At the 300ft. level driving has been carried on both N. and S. on the course of the lode—S. 120ft., N. 40ft. At the 100ft. level S. 40ft., N. 100ft. Great quantities of ore have been extracted from this shaft between the 300ft. level and the surface. Still there is a great quantity left that will be worked when required. For a considerable distance from Greenwood's shaft the ore body is horizontal, and is worked by shallow shaft and open cut. About 3 miles S. of the main workings the company have a few men working on a new lode 2ft. thick, of high grade in silver and lead. There are two vertical shafts on the property, sunk to a little below water level, which is about 220ft. from the surface. A pumping plant has been erected on one of the shafts, and the water from this shaft is pumped up to two tanks (6,000galls. each), which have been placed on an elevation close to the works, so that the water by gravitation can be taken to any part of the works. The mine is well equipped with modern machinery, viz., water-jacket furnace, two blowers, two engines to drive same, and an electric plant to light all the works. Considering the quantity of ore available and good prospects at deeper levels, I think the mine has many years of prosperity ahead of it. (I.M.R., 22-8-07.)

EMILY.—Situated near Big Hill, $1\frac{1}{2}$ miles from Great Gladstone. Galena occurs here in a brecciated limestone with gossan, striking N. and S. through slates and limestone. A sample of the ore yielded on assay 12ozs. 18dwts. 1gr. of silver to the ton, and 32 per cent. of lead. The gossan gave no result. The Inspector of Mines examined and reported in October, 1890, stating that there was a shaft down 58ft. on a very fine-looking lode of ironstone, containing small particles of galena, traceable through the lease. A sample from the cap assayed for silver gave no return, but one taken from the spoil-heap of the shaft gave $2\frac{1}{2}$ ozs. of silver per ton.

EUKABY.—A discovery of silver-lead was made 48 miles E. of Hawker by Dr. Stephens on his sheeprun at Eukaby Hill. Assays made by Mr. G. Goyder, jun., gave the following results:—

	Lead.			Silver.				Gold.		
				ozs.	dwt.	grs.		ozs.	dwt.	grs.
Galena yielded	60	per cent.	..	78	5	0	per ton.	..	0	0 14 per ton.
“	$31\frac{1}{2}$	“	..	15	17	0	“	..	0	0 22 “
“	44	“	..	15	4	0	“	..	0	0 6 “
“	70	“	..	77	1	0	“	..	1	14 16 “
“	62	“	..	35	8	0	“	..	0	4 14 “
Iron ochre and cerussite ..	—	“	..	0	3	6	“	..	0	3 2 “
Lead ore (black)	$61\frac{1}{2}$	per cent.	..	26	9	0	“	..	0	4 14 “
Ironstone and quartz ..	—	“	..	0	19	0	“	..	trace	“
Granular lead ore	$46\frac{1}{2}$	per cent.	..	2	16	0	“	..	0	15 13 “

At a subsequent period, the mineral deposits being extensive, several companies were formed under names given below. The general strike of the lodes is N.E., and they are more or less vertical and well defined.

Glen Osmond Union Mining Company.—Operations began on preliminary section No. 295, hundred of Adelaide, 4 miles S.E. from Adelaide, in December, 1846. Thirteen lodes were discovered, but work was confined to three situated on the N. and S. extremities of the section and in the centre. Adits and levels were driven, winzes and four shafts were sunk, and smelting works erected. This mine was at one time the property of Mr. Osmond Gilles. It was afterwards known as *The Gilles (Glen Osmond)*. The Government Geologist inspected this mine in 1888, and reported:—The principal workings are on the Victoria lode. There are three levels, viz., the adit, the 180ft., and the 260ft. levels. The strike of the lode varies from E. and W. to E. 10° S., and it is therefore parallel to the principal lodes on the other adjoining mines. The adit is the nearest level to the surface. It enters the hill on the W. side and is driven E. along the lode. At 280ft. from the entrance a shaft has been sunk from the surface to a depth of 100ft., connecting the level with the surface. This shaft has been continued down to a total depth of 260ft. Below this level, at a depth of 80ft., is the 260ft. or bottom level. This has been driven E. 60ft. and W. 15ft. or 20ft. Besides these levels there is another called the Vineyard level, which, it was stated, was 800ft. in length, and in a line with the 260ft., a space of 260ft. intervening between the W. end of the latter and the E. end of the former. In the adit level W. of the shaft there are two principal shoots of ore—galena, gossan, and carbonate of lead, which have been stoped out overhead but not underfoot, except at a place 60ft. from the shaft. In the adit level E. a shoot of ore has been stoped out for a distance of 70ft. or 80ft. along the level and to the surface and back towards the shaft; thence to the E. end of the level the lode has nearly all been stoped to the surface. One hundred and eighty feet level W.—With the exception of a small patch near a winze 60ft. W. of the shaft, no stoping has been done. One hundred and eighty feet level E.—The ground between the 180ft. and adit levels has all been stoped out as far as the end, 270ft., with the exception of a piece of ground some 60ft. long. Above this level (180ft.) most of the work has been done in early times, and the size and richness of the lode can only be approximately judged by the width of the excavations which have been made and the appearance of the portions of lode which are left standing. From these it would appear that the shoots of ore were richest and widest E. of the shaft, and that they dipped E., or into the hill.

Present workings.—In the 180ft. level a winze is being sunk to a distance of 70ft. E. of the shaft, and is now down 41ft.; E. of this ore has been stoped out underfoot along the level, but not to any depth; the shaft has been sunk 80ft. below the level, and a drive put in E. and W.; in the E. end 80ft. from the shaft rich ore, galena, and gossan, from 6in. to 1ft. wide, is showing in places. At 60ft. from the shaft a crosscourse occurs, dipping N.E. through the lode. This lode is in similar country and of the same nature as that of the Wheal Watkins and other lodes in the neighborhood; it strikes from E. and W. to E. 10° S., and the underlie is N., from vertical to 70° . Ferralcalcite, gossan, iron oxide, heavy spar, &c., are associated with the galena and carbonate of lead. The permanency of the lode can best be judged by the length of the drives along it and the number of the shoots and patches of ore. The width of lode formation varies from a foot or two to 4ft., and the ore-bearing shoots from 2in. or 3in. to 1ft. or more, expanding and contracting as is the nature of lodes. A lode called the North Victoria has been worked by shafts and cuttings from the surface to a shallow depth. It runs parallel to the Victoria at a distance of 40ft. to the N., and will doubtless be found by crosscutting from the lowest level on that lode.

Gore's lode is another parallel lode to the N., from which galena and carbonate of lead are being procured in two or three places not far from the surface. A tunnel, which cuts this lode at 30ft., is being driven S. towards the E. workings on the Victoria lode, the line of which it is expected to reach in about 500ft. It is now in 280ft., and has cut, besides Gore's lode, two other ore-bearing leaders. The

O.G. lode was not inspected, as the old levels were not in a fit state to pass along. Assays of six samples showed silver from 4ozs. 18dwts. to 35ozs. 9dwts., and lead 25 per cent. to 70 per cent., the highest value being from the bottom level.

By continuing the bottom level E., the shoot of ore E. of the shaft in the upper levels—which have evidently been the best and largest in the lode—will be met with, and a large block of unworked ground between this and the 180ft. level thrown open for stoping, from which a large quantity of ore may be expected; 190ft. has yet to be driven before the part of the lode explored by the upper level is reached. Beyond (E. of) this point the lode has not been driven on, and when this is done there is every prospect of fresh shoots of ore being passed through.

The continuation of the Vineyard tunnel to connect with the bottom level would also open up the block of ground between the adit level and this tunnel, which contains the shoots of ore worked in the adit level W. of the shaft. As water-level has not yet been reached, there is nothing to prevent at the same time the main shaft being sunk, drives put in E. and W., and new stopes opened up.

The O.G. Lode, on the adjoining land, is also a true lode, and runs parallel to the Wheal Augusta lode (of the Mount Osmond Mine adjoining), strikes towards the Mount Osmond ground, and should enter it at the N. end of section 1070. Other lodes probably exist here which do not show at the surface, but may be found by underground crosscutting.

The Glen Osmond lodes, in general, are small, compared with some of those at the Barrier. On the other hand, the ore contains the higher percentage of lead, and a fair amount of silver. (Government Geologist, 2-10-88.)

In 1889 operations were confined to three places. Mr. H. Conigrave, the secretary, reported that there are 14 lodes, six of which have been prospected and worked; they strike E. and W., and dip to the N. at a ruling angle of 70° ; widths from 1ft. to 4ft. The O.G. shaft and winze goes down 260ft., Victoria 310ft., Gore 178ft., (2) Verco 178ft. and 100ft., all following the dip of the lodes. The total length of drives is 4,947ft. Matrix—iron, calcspar, barytes, clay, gossan, and ferruginous quartz; country, calcareous clayslate. The ore is galena and carbonate of lead, giving an average assay of 21ozs. silver per ton and 71 per cent. lead. An English proprietary company worked the mine from 1847 to 1850, paying a royalty to the owners of one-eighth, and extracted from the property £30,000 worth of silver and lead. An unsuccessful demand for reduction of the royalty led to a stoppage of operations until the existing company commenced work. In May, 1891, the Inspector of Mines made an examination, and recommended Government assistance on the ground that the company was prepared with assistance to sink 500ft. for the development of the mine, to test the lodes at the depth of 150ft. below water-level. At a meeting of shareholders in 1895 it was stated that, owing to insufficiency of funds, mining work had not been resumed.

Wheal Watkins Mine.—Situated on section 910, adjoining and E. of the Gilles Glen Osmond. It was opened in 1843 and remained steadily productive until the year of the Victorian diggings (1851). The Government Geologist examined this mine in 1888, and reports:—The lode is known as Peachey's lode; it has a general strike of about E. 10° S., although this varies in places; the general underlie is N. at an angle of from 70° to 80° . Down to the 20-fathom level the lode has been worked out by tunnels from the N. flank of the hill, from which levels have been driven along the lode E. and W. Above the 30-fathom level the ore-bearing shoots may be considered as worked out, and apparently a large amount of ore has been removed. The main shaft, which has followed down the lode on the underlie at an angle of about 75° , has been cleared out to a depth of about 15ft. below the 40-fathom level; there is also a level at 30 fathoms, the W. portion of which has been cleared of mullock and debris from the upper workings, with which it was filled for a distance of 120ft. At 60ft. W. of the shaft there is a winze connecting this level with the 20-fathom level. Between the shaft and the winze the lode has all been stoped out in early times. W. only a small portion has been stoped. The

30-fathom level E. has been driven about 235ft., and has been stoped altogether for about 50ft. from the shaft up to the 20-fathom level, on separate shoots of ore. Half-way along this level there is a branching of the lode, or a cross lode, bearing N.E., which has also been stoped on to a small extent. Thirty-five feet from the shaft a winze has been sunk towards the 40-fathom level and a little ore stoped out. The 40-fathom level W. has been cleared out for a distance of 150ft., beyond which it is still choked with loose mullock; 70ft. from the shaft a winze connects it with the 30-fathom level; W. of this winze ore has been stoped out up to the 30-fathom level. Between the shaft and this winze there is a block of unworked ground, a portion of which is now being stoped, which contains a rich shoot of ore from 6in. to 1½ft. wide. Along the bottom of the 30-fathom level, above this stope, the lode can be seen to contain rich ore. The 40-fathom level E. has been driven 243ft. At 187ft. from the shaft a winze connects this with the 30-fathom, and a shoot of ore has been stoped on each side of this winze from one level to another. A winze is being sunk about 20ft. below the 40-fathom in one place, and galena and carbonate stoped. For a long distance the level has been driven on a soft ferruginous clayey lode of variable thickness. Below the 40-fathom level the shaft is now being cleared of the mullock with which it has been filled at some former time, and is now down 15ft. In each side of the shaft there is a soft clayey and gossany lode formation from 1½ft. to 2½ft. thick. The total depth of the main shaft, which has been cleared to the depth of 255ft., is said to be 480ft. The country rocks consist of clay and calcareous slates and limestone, having a low dip of 10° or 15° S. and S.E., which has been cut across by the fissure or fault, in which the lode has been deposited. From the well-defined appearance of the walls of the lode, the depth to which it has been followed, the width and length of the lode which have been worked out, and the lode still standing, I believe that it will be persistent in depth, and continue to develop rich patches or shoots of ore when followed down to greater depths. What ground is worked out below the 40-fathom level can only be ascertained after the shaft is cleared out and the blocked-up drives reopened. Judging from the fact that above the 40-fathom level large blocks of ore-bearing ground have been left almost intact E. and W. adjoining the shaft, it is expected that, as deeper levels are exposed, a larger extent of lode will be found unworked. So far as the deeper levels have been driven the lode still shows no sign of dying out. The continuation of these levels will probably, therefore, lead to other shoots of ore being met with. The occurrence of a cross lode, or branch lodes, makes it also a reasonable speculation that by crosscutting other parallel lodes may be found not far from the main lode. The quantity of ore raised from this mine appears, from the extent of ground worked out from the surface to the 40-fathom level, to have been considerable. In the absence of complete returns of the proceeds from the mine definite information on this point cannot be given. There are other lodes, such as Fink's, Gore's, &c., which have not been developed. It would be advisable to crosscut for these from the bottom of the present shaft when this has been reached.

Assays by the Government Assayer:—(1) Galena and gossan from winze E. of shaft, 40-fathom level, silver, 20ozs. 2dwts. per ton and 67 per cent. lead; (2) from stopes 49 fathoms W., silver, 22ozs. 4dwts. and 67 per cent.; (3) 22ozs. 17dwts. and 57 per cent.; (4) galena and gossan from stopes 40-fathom level W., silver, 15ozs. 14dwts.; lead, 55 per cent. Average of silver, 20ozs. 4dwts. per ton; lead, 61½ per cent. (Government Geologist, 25-9-88.)

Wheal Gwaler.—Section 909, adjoining the Wheal Watkins on the N. It was the first mine opened in this State. On account of the rich discovery of specimens of galena on the surface the land was purchased and mined. Work was started in May, 1841, and several tons of very pure galena was raised. From a trial made in England the yield was, dressed ore 77 per cent. lead and 19ozs. 4dwts. 4grs. silver per ton; undressed, 61½ per cent. lead and 19ozs. 2dwts. 4grs. silver per ton. In 1848 an assay made by C. E. Schonke, Calcutta, of 107 slabs of bullion sent

from the smelting works, Glen Osmond, yielded at the rate of 35ozs. silver to the ton, and one small one went as high as 70ozs. to the ton. The 107 slabs were the produce of carbonates, and the small slab was from the average ores. (1887.)

Mount Osmond Mine.—In August, 1888, the Government Geologist reported that work was being carried on at two places, viz., the Champion lode, section 1278, and the Wheal Augusta lode, section 1062.

Champion Lode.—A tunnel was being driven here along the course of a quartzite bar in clay and calcareous slates. In this, and near the junction with the slate, there are flat leaders of galena and gossan, associated with zinc blende, calcspar, and quartz. He was of opinion that this so-called lode is a bed of quartzite, originally sandstone interbedded with the slate, which has become upheaved at a steep inclination at this place. As it contains leaders of silver-lead, it is worth driving along on the chance of meeting with a lode, or larger bunches of ore. These bands of sandstone and quartzite are very frequent in the clayslates of the ranges here; sometimes they are of great thickness, as at the Glen Osmond quarry and in the vicinity; in other places they thin out to narrow bands a few feet in width, through the twisting up of the strata, with, perhaps, accompanying faulting becoming inclined at high angles or perpendicular, and thus resemble lodes.

Wheal Augusta Lode.—This is a true lode, with walls from 2ft. to 3ft. apart. The veinstone consists of gossan and quartz, with calcspar, barytes, carbonate of lime and iron, containing galena and carbonate of lead. The strike of the lode is from E. and W. to E. 10° S., and its underlie 70° to 80° N. The country rock is clayslate, calcareous clayslate, and limestone, lying in a slightly inclined position, and dipping at an angle of from 5° to 15° S. and S.E. Where the lodes were then being worked the slates are much cleaved and jointed; by sinking deeper into lower strata more solid country may be expected, the clayslate giving place to crystalline limestone, in which the lode will probably become larger and yield larger quantities of ore. The summit of the range through which the lode runs is, by barometer, 550ft. above the tunnel, and 650ft. above the base of the hill at Glen Osmond quarry. It is advisable to sink deeper below the tunnel at the same time as the tunnel is being driven, for the reason given above. Samples from the Wheal Augusta lode assayed 11ozs. 9dwts. of silver per ton, and 55 per cent. lead.

Ironstone and galena from the Champion tunnel returned 7ozs. 7dwts. silver and 35 per cent. lead. The ore after picking would assay much higher for both metals. (Government Geologist, 20-8-88.)

Glen Osmond Stone Quarries.—Several small parcels of galena have been saved from small veins during the working of the quarries.

Eagle.—The course of the lode is due E. and W., underlie N., with smooth and regular walls averaging 4ft. apart. A great deal of work has been done on the property in sinking shafts and tunnels. Ore sold averaged 47½ per cent. of lead and 10ozs. 5dwts. of silver per ton. Individual assays ranged higher, and the pyrites also carry gold. Mr. Kingsborough, the secretary, supplied the following information in 1890:—

The Eagle Mine is on section 1003, hundred of Adelaide. There are two lodes, ranging up to 6ft. wide, and two shafts, the deepest 115ft., and a winze 92ft., all following the dip of the lode, and 842ft. of drives. The ore is a sulphide, carried in a gossany matrix, and the country is a clayslate. The bulk assays have been 54½, 59½, 61½, and 53½ per cent. for lead, and 7ozs. 12dwts. 16grs., 11ozs. 12dwts. 12grs., 12ozs., and 10ozs. silver per ton.

The Inspector of Mines visited the property in March, 1890, and reported favorably of the prospects of the mine. In the bottom level from McDonald's shaft there is a shoot of zinc, assaying 45 per cent.; probably the lead will make again below. The width and regularity of the lode would indicate that large quantities of argentiferous galena will probably occur at a greater depth.

Macfarlane's.—In the neighborhood of the Glen Osmond mines, and forms one of the same group. Very little work has been done.

GLENALBYN.—Opened in 1850, and situated about a mile to the N.W. from Strathalbyn. At 18 fathoms below the surface a fine lode of galena was found, the ore of which was said to contain $18\frac{1}{2}$ per cent. of lead and $16\frac{1}{2}$ ozs. silver to the ton. A shaft was sunk about 30 fathoms, and the galena was found to be impregnated with yellow copper ore. Several hundred tons of the ore were sent to England. The mine ceased working in 1863.

GRAEFE'S.—On section 96, hundred of Morgan. The Government Geologist reported in 1896 that there was a vein of calcspar, ironstone, and gossan containing galena, striking N. and dipping W. at 30° to 40° , worth prospecting. The Government Assayer returned 67 per cent. of lead and 16 ozs. 14 dwts. of silver per ton from samples treated. The country rocks are clayslates, calcareous slates, and limestone, striking N. and S., and dipping at high angles, and sometimes vertical.

GRAY'S.—Hundred of Goolwa. The Inspector of Mines reported in 1890 that there was an outcrop of quartz upon which a shaft had been sunk to the depth of 45 ft. It was alleged that assays had given good returns of silver, but samples tested by the Government Assayer gave no result in silver or gold.

GREAT COMSTOCK.—Situated near Blinman. The Inspector of Mines states that a shaft has been sunk vertically 73 ft., and then continued on the underlie to a depth of 117 ft. on a poor formation consisting of calcite, barytes, and gossan, the surrounding country being limestone and argillaceous slate, not at all favorable for plumbiferous deposits. He did not observe any mineral of commercial value in the property, and no lode formation worth prospecting. (1889.)

GREAT GLADSTONE SILVER MINE.—Situated in the Pindelpena Creek, 6 miles N.E. from Yeralina Station. In April, 1888, the Government Geologist reports there is a lode formation, consisting of iron ore and gossan, containing fragments of the surrounding slate rocks, and striking N. and S. through the horizontal and slightly-inclined clay and calcareous slates. Several shafts have been sunk, and tunnels driven along the course of the lodes, and galena has been obtained in two or three places at no great depth. At the S. end of the workings galena, which assayed well for silver, has been obtained. The lode is well defined and worth testing. A sample of the galena and gossan gave 88 ozs. 7 dwts. 6 grs. per ton silver and 46 per cent. lead, and of gossan alone 1 oz. 15 dwts. 22 grs. silver per ton. In September, 1890, Inspector Parkes examined and reported that the width of a well-defined lode running through the property was 5 ft., but it was very mullocky. In the S. portion of the property a tunnel had been driven 87 ft. along the course of the lode, and an air shaft had holed at 40 ft. No. 1 shaft N. was down 90 ft., and No. 2 to 54 ft. No. 2 tunnel had been driven 182 ft., and the lode in it is of the same character as in the other workings. Two shafts have been sunk respectively 35 ft. and 82 ft. The most N. shaft on a lower site had cut water at 76 ft. This should be sunk deeper, as the lode stuff is better as depth is made, and indicates a possibility of obtaining payable ore at a deeper level.

GREAT NORTHERN.—Locality, 2 miles W. from the Great Gladstone. There are well-defined lodes of ferricalcite, calcite, iron ore, and gossan, striking N. and S. through horizontal slates. Prospecting shafts were being sunk at the time of inspection by the Government Geologist (1888), but nothing of value had been found. At the latter end of 1890 the Inspector of Mines reported that a shaft had been sunk 30 ft. on one of the outcrops; a sample he took gave no assay return of value.

HAHNDORF.—At this place a silver mine was opened many years ago, but it is not now worked. A quantity of ore was raised, said to be of rich quality. Pieces of quartz and reef formation were found to carry a small percentage of galena, containing silver at the rate of $1\frac{1}{2}$ ozs. per ton. Mr. W. S. Whittington, the original worker of this mine, stated that ore raised by his party was assayed by Mr. Cosmo Newbery, and by assayers in England and Germany, and gave on an average 71 per cent. of lead and 21 ozs. of silver to the ton. Operations were stopped by the flooding of the main shaft, and want of capital. The workings are in soft kaolinised clay, and sandy and plumbagenous slates. (1887.)

HENDER'S PROPERTY.—Situated in the hundred of Strathalbyn. The Inspector of Mines in 1890 reported that there were three parallel lodes outcropping, two of them large and composed of quartz, and the other a small ironstone lode. Upon the latter a shaft had been put down 20ft., and about 100ft. distant a costeaning trench, 20ft. long by 7ft. deep, showed the lode to be 2ft. wide at surface, but that it pinched considerably in the bottom of the excavation. No indication of either silver or lead. A shaft sunk to a depth of 50ft. on one of the quartz outcrops does not cut the lode, a mistake having been made as to the dip.

HELENE.—The Inspector of Mines reported that this is situated on a large iron "blow" on a slight elevation, flanking a low range near Minburra Station. A shaft was sunk 75ft., and a drive was put E. and W. on the course of the lode, which consists of gossany ironstone of great width. It has a N.E. and S.W. course. The surrounding country is clayslate, traversed by strong quartz reefs. (1889.)

HICKS'S SHAFT.—Situated near the telegraph line between Snaky and Starvation Creeks, Kangaroo Island. It is an abandoned working, with shaft and costean pits in a broken mass of quartz reef and quartzose rock. The Government Geologist recently visited this place, and states that there is nothing to show that any metallic mineral has ever been found in the workings. It was probably a prospecting venture. (1898.)

HILL'S.—Situated close to Mount Freeling. The Inspector of Mines reported (1890) that a shaft had been sunk 16ft. on a large ironstone and limestone outcrop, striking E. and W., all along which splashes of galena were to be seen. Samples taken did not yield silver or gold, but it was alleged that some fair returns of silver had been obtained. The property requires a thorough test.

HOOPER'S LUCK.—A claim, situated 5 miles S.W. from Waukaringa, worked for silver and lead on a regular and continuous outcrop of quartz and gossany ironstone, which extends for miles. Where the gossan prevails the lode makes and carries a fair percentage of lead. Three shallow shafts have been sunk and costeaning pits dug, and in these the lode formation may be seen, varying in size from 1ft. to 8ft. The course of the lode is W. 3° S., with an underlie S.E. at an angle of 75° . The lode matrix is admirably adapted for concentration, as the waste is very light. This claim is well worth testing to the water-level. From a bulk assay of 3 tons of ore, obtained from a surface trench and roughly dressed, 30 per cent. of lead and 6ozs. 14dwts. of silver per ton were obtained. (Inspector of Mines, 1890.)

HOPE.—Locality, about 7 miles E.N.E. from Taltabooka. Shafts have been sunk, one to a depth of 100ft., and crosscuts driven in slate and sandstone, near iron ore, gossan, and crystalline limestone outcrops, which are not lodes, and do not appear likely to contain any useful metal. (Inspector of Mines, 1889.)

IMPERIAL MINT.—The Inspector of Mines reported in 1890 that this mine is 25 miles E. from Leigh Creek Railway Station. In several places lodes have been opened up, and lead in carbonate and sulphide forms can be obtained, but not in payable quantities. The ground consists of micaceous and talcose schists, overlying a hard blue slate, and the outcrops of lodes are ironstone stained with oxide of lead. There is a vertical shaft 92ft. deep, carried down to 50ft. in a formation composed of galena, pyrites, and argentiferous gossan, and then hard blue slate comes in. At the bottom a crosscut has been driven, and a winze put down. There is a break in the slate, and walls are showing, enclosing what appears to be lode material about 3ft. wide, but no trace of lead or iron can be found in it.

JOKER (N.E.).—About 20 miles E. from Ketchowla Station. A large amount of sinking and driving has been done at this place on the ironstone outcrops on the strength of traditions that silver had been found. The Government Geologist, after inspection in 1888, came to the conclusion that there were no lodes on the property nor any inducement for anyone to do more than prospect the surface. The samples he tested were destitute of silver or any other metal of commercial value.

JOKER (Mount Freeling).—Four miles S. from the old police station. In May, 1892, the Inspector of Mines reported that a vertical shaft 42ft. deep and some pits had been sunk and a drive put in from shaft, which disclosed nothing of value. On a large quartzite dyke small spats of galena are to be seen and also in the jointings. The dyke has been mistaken for a lode.

KANGARILLA MINE.—This property is situate on sections 797 and 796, hundred of Kuitpo, about 22 miles S.E. from Adelaide. The workings consist of a tunnel 150ft. long and a shaft at the mouth of the tunnel full of water. A trace of ore shows on one wall here and there, and a vein of galena and carbonate of lead about 3in. or 4in. wide extends for 20ft. or 30ft. along the bottom of the drive. The sinking is very hard, and the ore-bearing portion of the lode very limited, so that unless it is very rich in silver it would not pay to follow. (1887.) The Inspector of Mines in 1888 reported that at the place where the principal work had been done there was a true lode formation about 3ft. wide, running E. and W., with a N. underlie. The work then done on the mine included Lean's tunnel, driven on the course of the lode 100ft., the formation being very small throughout; and on a shoot of ore cut near the entrance, followed down for 50ft., when sinking was stopped because the influx of water was heavy. No. 2 shaft was on the hill, and was sunk to the level of the tunnel, 90ft. A good shoot of ore was passed through dipping E., and several tons of fair ore were obtained. A level was being pushed W. from the bottom of the shaft to connect with Lean's tunnel. This would save hauling, and enable operations to be concentrated on the shoots of ore, besides assisting in the important work of sinking the shaft to a greater depth. There was every indication that this lode would improve in depth.

KEYNETON KING.—Hundred of North Rhine. The Inspector of Mines reported (1889) that this contains two distinct iron outcrops, upon which several openings had been made, showing formations composed of manganic iron, silica, and galena, with pockets of a kindly-looking gossan. Galena taken from the footwall and submitted to the Government Assayer gave 63 per cent. of lead and 32ozs. 13dwts. silver per ton, and from the hanging wall 8ozs. more silver. Samples taken from the bottom of the opening, 16ft., gave—(1) 60 per cent. of lead and 35ozs. 2dwts. silver per ton; (2) 69 per cent. and 45ozs.; (3) 68 per cent. and 41ozs. The 16ft. sinking produced about 2½ tons of hand-picked ore of similar quality. The course if the lode is N. and S., with an underlie E. Mr. Niehaus supplied the following additional information:—More than 30 years ago Captain Rodda mined for silver on the neighborhood unsuccessfully. It is only recently that the true fissure lode was discovered. There are two parallel lodes, 4ft. and 5ft. wide respectively. There are four shafts, two vertical and the others following the dip of the lode, which has a matrix of iron gossan and clay. Harrold Bros. gave an assay of 62ozs. silver per ton and 76 per cent. lead, and a bulk of 1½ tons gave 39ozs. silver per ton and 64 per cent. lead. (1890.)

KEYNETON PROPRIETARY.—Hundred of North Rhine. The Inspector of Mines, in 1889, reported that a considerable sum had been spent in costeaning and sinking shafts, some apparently without a definite object, and one is in a slate formation its whole depth. In the trenches lead has been found in small pockets lying on hard limestone. The country is not favorable for lead ores in large bodies, and there is nothing in the property justifying further expenditure.

LADY ELIZABETH.—Locality, about a mile S. from Olary Railway Station. A shaft has been sunk about 20ft., and a drive put in for a short distance. Galena in small quantities is disseminated through the limestone rock, but the prospect of a lode being found is not encouraging. (Government Geologist, 1888.)

LADY FRANKLIN.—Section 153, hundred of Warrow, 4 miles S. from Marble Range Trig. Station, and 30 miles from Port Lincoln. The Government Geologist inspected this property in 1897, and stated that prospecting shafts and costean pits had been sunk through Tertiary limestone, clay, and gravel, into the bedrock, some to water-level, 20ft., and others to a greater depth. The main shaft was down

60ft., sunk through talcose argillaceous rock, steatite, and serpentinous slate, with white granular quartz, blue solid quartz veins, and soft argillaceous material. Galena, zinc blende, and pyrites occur in what appears to be a wide lode formation or cap of a lode, and probably payable deposits of silver would be found on further prospecting. There is also a fair chance of the lode formation proving auriferous. Samples of quartz from 55ft. had assayed from 5dwts. 23grs. to 12dwts. gold per ton. At a meeting of shareholders in May, 1898, it was stated that samples of ore smelted at Wallaroo gave 22 per cent. lead, and 1½ozs. silver, and 12grs. gold per ton. Subsequently to that date the main shaft had been carried to a depth of 88ft. Galena in a small bunch was struck at 78ft., continuing to 82ft., assaying 22 per cent., 27½ per cent., and 33 per cent. lead and 2½ozs. silver per ton. Below 82ft. no galena was visible. Water making 1,500galls. per hour.

The Inspector of Mines, reporting September 15th, 1899, states that the principal shaft had been sunk to a depth of 82ft., and the water being within 20ft. of the surface the workings could not be inspected, but he was informed that the quartz lode containing gold had been passed through at 55ft. from the surface. At the 60ft. level small bunches of galena, zinc blende, and pyrites were struck, which assayed 22 per cent., 27 per cent., and 33 per cent. of lead, with 2½ozs. of silver per ton; this formation was passed through at about the 80ft. level, the bottom of the shaft being in hard rock, with no metal visible. Six horsepower portable engine, in good condition, on the ground; but the pumping appliances, though equal to keeping the water down to the present level, 82ft., are quite inadequate for further sinking; he therefore recommends opening out at the 80ft. level, to enable the quartz vein and galena formation passed through to be explored, when further operations could be decided on. A sample taken from the ore dump gave on assay no gold and 1 per cent. of copper. (I.M.R., 15-9-99.)

LOBETHAL.—A silver mine was opened near this township many years ago. The lode runs N. and S., and is composed of iron gossan, quartz, and mundic. A vein of cobalt and silver is said to exist in the same lode, being principally an ore of cobalt. (1887.) Samples from the dump and the formation recently tested only showed a trace of cobalt.

LLOYD'S SECTION (See CHERRY GARDENS).

MANGALO (Franklin Harbor district).—Near a hut on Mangalo Creek thin veins of galena traverse mica schist and mica slate over a space of 40ft. to 50ft. in width. The galena is also found on the surface in the form of small rounded slugs. There are no workings, with the exception of a trench about 6yds. long and from 4ft. to 5ft. deep. The rock is soft, and easily worked. The following were the results of assays made by the Government Assayer:—(1) galena, 2ozs. 9dwts. of silver; (2) galena, 2ozs. 9dwts.; (3) galena, 9dwts. 19grs.; (4) galena, 1oz. 15dwts. 22grs.; (5) galena, 16dwts. 8grs.; (6) galena, 2ozs. 15dwts. 12grs. per ton. (1887.)

MACK'S PROSPECT.—Situated on section 1278, hundred of Adelaide. A considerable amount of work was done about 1890 on a lode which it was said contained silver and lead.

MANNAHILL PROPRIETARY.—Situated near Wadnaminga. No. 1 shaft, according to the report of the Inspector of Mines (1892), has been sunk a vertical depth of 90ft., and thence a drive has been put in S.E. a distance of 65ft. The sinking has been in a calcareous slate, with no indication of a lode. No. 2 has been put down (for the most part on an underlie) 59ft., in a small mullocky formation of no value. Klemm's shaft is down 35ft. There are only very small superficial deposits of ferruginous quartz and galena, and no defined lode. The mine is not worth further outlay.

MARSHALL'S.—Situated about 3 miles S.E. from Nichol's Nob. The Government Geologist reported in 1891 that there were shallow shafts sunk, and that there is a very large lode of ironstone, kaolin, and gossan, from which samples were taken. The assays went from nil up to 62ozs. of silver per ton at 25ft. from the surface, and indicated that there were rich patches or veins containing silver, which is in the form of chlorides.

MCGRATH'S.—Situated near Trinity Hut. The Inspector of Mines has reported that a large lode running E. and W. is in this holding, but little work had been done on it. A sample taken from the lode, composed of ferruginous quartz and galena, assayed 22ozs. 4dwts. silver per ton and 12 per cent. lead.

MILDALTE.—*Vide* page 83.

MONTAGUE'S NEVADA.—Situated about 22 miles E. of Leigh Creek. In April, 1898, a heavy body of ore, containing lead and silver, was reported to have been met with in the W. stope at the 70ft. level; also that the E. stope was yielding good ore.

MOORE BROS.' DISCOVERY.—In slate country; about $1\frac{1}{2}$ miles S.S.E. of the Mingary reefs, a discovery of silver-lead was made. The galena and carbonate of lead form a vein about 12in. thick, underlying W. at a low angle, and galena occurs in a very pure condition in large slabs. An assay made by the Government Assayer gave 18ozs. 6dwts. silver per ton. (1888.)

MORIALTA.—Locality, section 1164, hundred of Adelaide, where are also the Morialta gold diggings. The Government Geologist reported in 1897 to the effect that a reef outcrop showed for 350ft. along the base of the hill, which had been opened by short tunnels and pits for that distance. The lode, striking N. and S., contained brown iron ore, gossan, quartz, and argillaceous matter, mixed with the bedrock, and underlies E. into and beneath the hill. In the principal workings, at the N. end, there is a well-defined outcrop varying in thickness from 1ft. to 3ft. or 4ft. The dip of the formation in these appears to coincide with the bedding of the rocks, which dip at an angle of 18° to 20° E. In the workings toward the S. end, so far as they have gone, the formation has a much steeper dip in the same direction, and appears to intersect the strata—not sufficient work had been done to show its actual thickness. The probabilities are in favor of a fair-sized argentiferous lode being developed when the ground has been opened up and properly prospected, and it is likely, considering the auriferous nature of the district, that portions of the lode may prove to be also gold-bearing. In places the veinstone is rich in silver. The School of Mines assay gave from a trace up to 560ozs. of silver per ton (ironstone with oxide of antimony and lead).

On January 21st, 1898, the Geologist reports that since his last visit one of the inclined shafts has been driven on the lode formation to a total depth of 106ft., at an inclination of 24° E., and is now the main shaft. At the bottom a large bunch of quartz replaces the argillaceous and ferruginous formation previously passed through. It is advised that this shaft be widened and timbered where necessary for safety and efficiency, and that at 100ft. from the surface, which is supposed to be water-level, drives be put in N. and S. on the lode formation for the purpose of ascertaining in which direction the rich shoot of silver ore outcropping at the surface, dips and its extent; also that the shaft be continued for another 100ft., and then opened up by levels N. and S. on the lode, should the developments met with in the levels at 100ft. warrant this. Nine samples were taken, which gave on assay from a trace to 64ozs. 7dwts. silver per ton. Most of the samples also showed a trace of gold. In January, 1899, the locality was again visited. The work done since the previous inspection had been chiefly confined to deepening some of the shallow shafts and cuttings and excavating ore from the outcrop, where it was known to be rich in silver. Samples for assay were again taken, and of these three samples from a shallow shaft, 160ft. S. from the main inclined shaft, returned respectively 11dwts., 2ozs. 14dwts., and 2ozs. 16dwts. of silver per ton. Two samples from the outcrop about 30ft. S. from the main shaft returned respectively 73ozs. 12dwts. and 1oz. 3dwts. of silver per ton. From all the assays it appears that the payable portion of the lode, so far as explored, is confined to about 40ft. of outcrop, and that the silver contents of this shoot of ore are variable and uncertain, but the opinion is still expressed that this silver locality is worth systematic prospecting in the manner suggested in the previous report; such work will alone determine the extent and value of the deposit, and the presence of argentiferous ore in this place warrants the thorough exploration of the lode.

Assay returns of three small parcels sold showed respectively—2 tons 2cwts., 41ozs.; 4 tons 2cwts., 40ozs.; 7 tons 10cwts., 24ozs. of silver per ton.

MOUNT MALVERN.—Situated on Mr. Partridge's property between Blackwood and Cherry Gardens. The Inspector of Mines (Mr. Parkes) reported (December, 1890) that a shaft had been sunk 116ft., which in the first 60ft. passed through a very fair lode formation carrying chlorides of silver. Between 60ft. and 90ft. nodules of galena were obtained, and from that depth to 116ft. the shaft was in a "horse" of mullock. Two drives were put in and a winze. The lode in one place was opened fully 12ft. wide, but no wall was reached. Throughout the whole of the lode formation bunches of galena and cerussite are seen, which promise increase of size at a greater depth. In the face of the 90ft. level the barytes, 4ft. wide, carries a little lead, and shows signs of making larger towards the footwall. The lode has apparently been "thrown" to the N. A bulk sample assayed 17ozs. 13dwts. of silver and 57 per cent. of lead. This should stimulate further operations. Another inspection was made in March, 1893, when it was found that a large amount of sinking and driving had been done, besides the erection of machinery. McDonald's shaft had been sunk to 175ft., a winze holed from the 50ft. level, and levels had been driven E. and W. from the bottom of the shaft. The E. drive had been holed to Harvey's shaft, which is 313ft. deep, and to the bottom of which a substantial skip-road had been constructed, and other good mining work done. The sum of £4,722 had been disbursed in machinery, and nearly 235 tons of ore had been taken out for a gross return of £1,196 2s. 6d. Plenty of ground was ready for stoping, but the ore was too small in quantity and low in quality to pay. Samples from the bottom of the shaft assayed 15ozs. 17dwts. of silver and 75 per cent. of lead. The lodes opened up improved in depth and warranted further exploration.

The Inspector of Mines (Mr. W. H. Matthews) furnished the following report in 1906 :—This property was worked for some time until about eight or 10 years ago, when, owing to the low price of silver and lead, and the smelter which was erected collapsing, all operations were discontinued. So far as can be examined the principal works consist of two shafts, known as Harvey's and the original prospecting shaft, together with drives, stopes, and winzes from the various levels. Owing to portions of Harvey's, or the main shaft, having fallen in, and its general dilapidated condition, it could not be examined, but the Inspector was informed that the depth of 325ft. on the lode incline had been reached, with drives opened at the 292ft. level, which are all now full of water. The total depth of the prospecting shaft is 160ft., partly vertical and partly on the lode incline, which is about 1 in 12. A winze has been sunk to the depth of 60ft., and drives have been made at the 100ft., 160ft., and 220ft. levels, in lode matter consisting of barytes (heavy spar, sulphide of barium), with veins and bunches of galena. 100ft. level.—At this point drives have been made on the lode E. and W. fully 100ft., exposing lode matter from 1ft. 6in. to 2ft. wide, showing lead crystals in the barite formation. 160ft. level.—This drive has been extended E. about 140ft. and connected with the main shaft. The lode formation consists of friable gritty sandstone and barite, ranging from 12ft. to 14ft. wide, containing vein matter occurring in seams and bunches throughout the formation. Towards the footwall side the stopes have exposed bunches and splashes of galena 2ft. wide of excellent quality; this has been stoped for about 20ft. in height, and there is very fair ore showing in the face. 220ft. level.—This depth has been reached by the winze sunk 60ft. from the level above. At this point the lode formation is of similar size and character to that disclosed at the 160ft. level, except that the barite formation has increased to fully 8ft. in width, and from samples taken the metal contents are considerably higher than in the similar material. In the upper workings at this level the same shoot of galena ore has been exposed, and, taken in bulk, is of similar value as at the 160ft. level, the character and occurrence of the vein matter being the same in many respects. 280ft. level.—From the 220ft. a second winze has been sunk 60ft., making a total depth of 280ft. from surface. Owing to water this level, which is the most

important, could not be examined; but I was informed from reliable sources that the lode at the bottom is still making larger and the value is improving; which statement, judging from the gradual improvement that has taken place from the 100ft. to the 220ft. levels, I see no reason to doubt. The mine records show that there has been dispatched to the smelters 218 tons of ore, returning an average value of 13ozs. of silver per ton and 54 per cent. lead. One parcel taken from the bottom, or 292ft. level, yielded 32ozs. silver per ton and 58 per cent. lead. From a very careful examination of this property and the returns previously obtained, I am strongly of the opinion that as a mining venture its prospects will fully warrant further explorations by sinking a vertical shaft to the depth of 300ft. This, owing to the surface formation and the position of the proposed shaft, would be about 50ft. below the old workings. So far as can be seen the cost of the work would not be excessive, as apparently the ground on the hanging-wall side is of a friable nature, and not expensive to work. A small winding plant, consisting of vertical boiler, double-cylinder engine, and double winding gear, would doubtless fulfil all requirements until the mine has been thoroughly tested. Eight samples were taken from the various levels, which gave the following results:—100ft. level, barytes lode, from 18in. to 2ft. wide, 5ozs. 8dwts. silver per ton, 1.8 per cent. lead; 100ft. level, barytes lode, from 18in. to 2ft. wide, 1oz. 8dwts. silver; 160ft. level, barytes lode from stopes, 5ozs. 4dwts. silver, 23.2 per cent. lead; 160ft. level, vein 2ft. wide, containing bunches of galena, 12ozs. 12dwts. silver, 78.3 per cent. lead; 160ft. level barytes, copper-stained, 10dwts. silver; 220ft. level, vein 2ft. wide, containing bunches of galena, 13ozs. 2dwts. silver, 61 per cent. lead; 220ft. level, barytes, cerussite, and galena, 18in. wide, 8ozs. 12dwts. silver, 19.8 per cent. lead; 220ft. level, barytes, cerussite, and copper stains, 2ozs. 17dwts. silver, 5.4 per cent. lead. (I.M.R., 25-11-06.)

Operations here have been recently restarted.

MOUNT CARRIE MINE.—Situate $4\frac{1}{2}$ miles from Angorichina Head Station. After an examination in 1891, the Inspector of Mines reported that a large and well-defined lode of barytes can be traced here, but the only work done had been a drive cutting 10ft. into the lode without reaching the hanging-wall. Samples assayed for silver did not give any return; but the lode should be tested at depth.

MOUNT DISTANT.—Here there is a galena lode at the top of the Mount, W. from the Gilead P. Beck Mine. The Inspector of Mines examined this property in the latter part of 1890, and reported that there was only a small underlie pit sunk on a thin vein of ironstone and galena, which he considered not worth prospecting.

MOUNT LOFTY PARK SILVER-LEAD MINE.—Situated on section 840, hundred of Onkaparinga. The Inspector of Mines (Mr. Rosewarne), after examining the property, reported that the workings consisted of a drive on the course of the lode about 25ft., in which a winze had been sunk 24ft. At 18ft. drives were put in E. and W., and in the latter 11ft. exposed a solid lode of cubical galena $2\frac{1}{2}$ ft. thick. The E. drive is about 20ft., but the lode is not so large in the back, though similar to the W. portion under foot. The course of the lode is E. and W. with a slight dip to the N. The shoot of ore appears to be making payable ground in depth. The lode running into steep hills may be advantageously worked by means of tunnels, and about 300ft. of backs might be obtained by about the same length of drive. Since the date of this report a tunnel has been driven at a lower depth and a winze put down, and other drives put in on the course of the lode. Work partly suspended, pending mechanical appliances being obtained for dealing with the water and dressing the ore. (1889.) Subsequently the mine was abandoned owing to the large quantity of zinc blende in the lode, and a lack of capital on the part of the small company working the mine.

MOUNT LYALL.—Locality, $1\frac{1}{2}$ miles N. of Wirriappa. A great deal of costeaning was done near some outcrops of iron, and promising assays of silver were said to have been obtained, but the Inspector of Mines reported that he saw nothing that would warrant working. (1889.)

MOUNT RHINE SILVER MINING COMPANY.—Situated on section 17, hundred of Angas. The secretary (April, 1890) supplied the following particulars:—There is an E. and W. lode, in the upper part 5ft. wide and increasing to a width of 40ft., and another N. and S. many yards wide; dip 45° S. A shaft is down 80ft. and a winze 80ft.; and drives have been put in 180ft. and 30ft. The ore gives from bulk 100zs. of silver to the ton and 20 per cent. of lead. Some assays have given 450zs. of silver and 70 per cent. of lead, and one 490zs. of silver and 1½zs. of gold. This mine was working for two years, in the first instance for silver, but latterly for ochre, (1890.)

The Inspector of Mines, in 1891 (Mr. J. V. Parkes) reported that a tunnel had been driven 196ft. on the course of a lode striking W. 30° S., consisting of ferri-siliceous limestone and ochre, in which there are small patches of galena. A sample taken assayed 40zs. silver per ton and 20 per cent. of lead. Other workings have included stopes and the sinking of winzes, and though the silver prospect was only moderate, the Inspector regarded the mine as valuable because of the ochre alone. On an average the lode is 4ft. wide, and is enclosed by walls of micaceous schist. The mine had been worked cheaply, and should be energetically developed.

MOUNT SERLE LOCALITY.—Thirty-two miles E. from Leigh Creek Railway Station and about 1½ miles E. of Stuart's Waterholes. A promising lode of rich galena and carbonate of lead has been prospected 2ft. or 3ft. below the surface. Between Finke's Springs and Frome Well galena and carbonate of lead have been found in three or four localities in clay and calcareous slaty shale, the lode formation being calcespar and ferricalcite, with sometimes quartz and ferruginous gossan. These lodes are worth further prospecting. Assays made by the Government Assayer from ore procured from these claims show:—Cerussite, 1½ miles E. of Stuart's Waterholes, 58.5 per cent. lead and 30zs. 9dwts. silver per ton; galena, 65.4 per cent. lead and 1oz. 3dwts. silver; galena from No. 2 claim, 1½ miles W. of Frome Well, 70 per cent. lead and 80zs. 10dwts. silver; cerussite from most W. claim, 70 per cent. lead and 70zs. 4dwts. silver. (Government Geologist, 27-4-88.)

NEVADA.—Locality, 1½ miles N. from Wirralpa. There are several iron outcrops, one of them a fissure lode 12ft. thick. A downright shaft 30ft., a crosscut 9ft., and a shaft continued 70ft. on the underlie at an angle of 50° showed no encouraging results. Samples taken by the Inspector of Mines showed no trace of silver. (1889.)

OLARY SILVER.—Situate 2½ miles from the Olary Railway Station, formerly known as *Batchelor and Moody's Great Iron Blow*. At the period of the Government Geologist's visit (August, 1888) a shaft had been sunk on the N. side, and another was being sunk (depth about 45ft.) on the S. side of a large outcrop of silico-ferruginous lodestone stained with copper carbonate, and containing pyrites. The stone looked likely for gold, and an assay of a sample of the ore containing pyrites yielded silver at the rate of 30zs. 9dwts. per ton; gold, a trace. There are numerous quartzose and ferruginous reefs with copper stains in the neighborhood which appeared likely to contain gold. The rock formation is gneissic micaceous granite, mica slate, &c., with eruptive granite.

The Inspector of Mines reported in 1889 that there is a strong lode, which can be traced fully 2 miles, bearing E.N.E. and almost vertical, chiefly quartz, but at intervals making large siliceous ironstone "blows." A good deal of work had been done, and a shaft sunk 110ft. on a solid body of pyrites. Two assays showed respectively 1dwt. 12grs. and 1dwt. 8grs. of gold to the ton. The auriferous pyrites were likely to become richer in depth.

OLD STRATHALBYN MINE.—This adjoins the Wheal Ellen property. A shaft was sunk in the gossan for a depth of 4 fathoms, and then the gossan was found to carry gold and silver down to 7 fathoms, when it began to make carbonate of lead. Sinking deeper, the lode was found to be about 12ft. wide, and to be composed of sandy mundic, zinc blende, and galena of low percentage. A drive at the 17-fathom level cut through about 10ft. of zinc blende and galena of about 20 per cent.

of lead. At this level a counter branch was met with composed of white quartz and galena, free of zinc and mundic and rich for silver. At the 22-fathom level a change took place, the galena and zinc blende forming themselves into separate leaders. Specimens are said to have yielded 65 per cent. of lead and 40ozs. of silver to the ton. The shaft was sunk 7 fathoms below this level. There is no record of ore raised, and the mine has not been worked for many years. (1887.)

In May, 1907, the Inspector of Mines reports as follows regarding this property:—It comprises 40 acres, situated about 2 miles from the township of Strathalbyn. It was opened and worked by private enterprise in 1848, was afterwards abandoned, and remained so until recently, when an Adelaide company took possession and resumed operations. In consequence of the water, the old workings could not be examined; but so far as I could ascertain the main shaft had been sunk to the depth of 180ft., and a fair quantity of good ore extracted. Beyond this no further reliable information could be obtained. Works of the present company have been principally confined to the sinking of a main incline shaft to the depth of 180ft., which it is intended to eventually connect with the old workings. Lode formation is chiefly composed of micaceous schist, striking N. and S., with an E. underlie slightly over 2ft. in 6ft., very regular and well defined, the product being silver, lead, and zinc, the latter being at present the predominating metal. At the 60ft. level a drive has been driven N. 62ft., exposing lode matter 4ft. wide. In the face the ore vein is contracted, apparently having passed through the main ore shoot, which has every indication of dipping S. In the shaft bottom, which is about 100ft. below the sulphide zone, the lode formation has been disclosed from 8ft. to 9ft. wide. The manager informs me that by means of bore holes he has proved the formation to be 14ft., which doubtless is correct, there being at the time of my visit no footwall visible. At this point a drive has been driven 10ft. S. towards the old workings. On the hanging-wall side there is a vein from 18in. to 2ft. wide, containing a fair percentage of zinc, with lesser quantities of lead and silver. The remaining portion of the lode is of rather low value, but probably may improve as the drive is continued S. towards the old main shaft, which appears to have been on the principal ore body. Fifty feet above the bottom workings an opening has been made in the S. end of the shaft, disclosing vein matter similar to that described, all containing silver, lead, and zinc to a more or less extent. Machinery on the mine consists of a double cylinder winding winch, with double winding gear, and vertical boiler, the whole being securely housed, and capable of continuing the work of development to a deeper level if required; also a Marsh sinking pump, not yet in use. Six samples taken from underground and the ore dumps returned as follows:—Bottom drive, vein of ore from 18in. to 2ft. wide, on hanging-wall side—silver, 8ozs.; lead, 8 per cent.; zinc, 20.4 per cent. Bottom drive, bulk sample, 4ft. wide, taken from hanging-wall side—silver, nil; lead, 0.5 per cent.; zinc, 7.9 per cent. Bottom drive, bulk sample, 4ft. wide, taken from footwall side—silver, nil; lead, nil; zinc, 1.6 per cent. Sample from small parcel of ore raised from S. end of shaft—silver, 7ozs.; lead, 8 per cent.; zinc, 12 per cent. Bulk sample taken from ore dumps rising in sinking shaft—silver, 1oz. 12dwts.; lead, 3 per cent.; zinc, 5.7 per cent. Sample from hanging-wall side of lode, probably portion of hanging-wall—silver, 15dwts.; lead, 0.8 per cent.; zinc, 1.8 per cent. (I.M.R., 30-5-07.)

PARTIDGE'S PROSPECT.—Situate on section 269, hundred of Noarlunga. The Inspector of Mines examined this property in 1890, and reported that an outcrop of heavy spar could be traced 200ft., striking E. and W., and underlying N. 53°. A shaft had been sunk, and a pit 150ft. to the E., each exposing the lode. Samples from surface ironstone and barytes gave 5dwts. of silver per ton; another, from shaft, 28ozs. 16dwts., in barytes and chloride of silver—the latter an unusual association with heavy spar, and noteworthy, as much silver may have been lost in other mines in the spoil-heap from want of knowledge of this possibility.

PATSEY'S SPRINGS.—One mile W. from these springs there is a lode composed of galena and carbonate of lead, calcspar, and quartz. An assay of the ore gave 7ozs. 2dwts. 11grs. of silver per ton, and lead 57 per cent. (1888.)

PERSEVERANCE.—Situated on section 52, hundred of Cassini, Kangaroo Island. Some shallow shafts have been sunk, affording no information as to lodes or formations. The Government Geologist took two samples from a heap of quartz and zinc blende ore lying near one of the shafts. One returned—zinc 39.1 per cent., gold a trace, silver 12dwts.; the other, zinc 31 per cent., gold and silver nil. The bedrocks are clayslates, sandstones, and quartzites. Strike, E. and W.; dip, vertical and S. A little galena visible in the lodestone. (1898.)

A little work has been done here recently. (1907.)

PETER'S HILL.—Situated 5 miles E. from Riverton. The Inspector of Mines reported (1890) that a shaft had been put down 90ft. on a well-defined lode. Silver and a good class of copper ore had been obtained, and assay returns for the former gave 25ozs. 9dwts. per ton, with $40\frac{3}{4}$ per cent. of lead. A small vein of quartz gave 15grs. of gold and 6dwts. of silver per ton. A sample of galena yielded upon assay 22ozs. 1dwt. of silver per ton and 75 per cent. of lead. Another shaft had been sunk, and there were winzes, but examination could not be made because of the water in the mine. His opinion was that this is a true lode, enclosed in argillaceous slates, and dipping E. 55° , and that the mine is worth further prospecting.

PHILLIPS'S MINE.—*Vide* YATTAGOLINGA, page 155.

PRINCE ALBERT.—Locality, about 30 miles S.E. from Mannahill Railway Station, and about $1\frac{1}{2}$ miles from the Dark Hill claims, near Giles' Nob. The Inspector of Mines (1888) reported that there was a vertical shaft 80ft. deep, from the bottom of which a crosscut had been driven S. 147ft. In the costeaning pits S. of the shaft there was a large body of quartz exposed, in which lead in the form of carbonate and sulphide could be seen. No 1 shaft was sunk vertically 28ft., then at an angle of 52° for 22ft., following the underlie. At this depth a crosscut was driven 26ft., all in lode formation, pockets of lead ore being frequently met with. Samples taken from various places in this crosscut gave, according to returns by the Government Assayer—(1) 61 per cent. of lead, 14ozs. 1dwt. silver per ton; (2) $67\frac{1}{2}$ per cent. of lead and 16ozs. 16dwts. of silver; (3) 70 per cent. of lead and 21ozs. 18dwts. silver; (4) 30 per cent. of lead and 10ozs. 14dwts. silver per ton. That the lode makes in depth was shown by the fact that at 20ft. vertical the lode is barely 6ft. wide, whilst 30ft. deeper it has been proved for 26ft. without the hanging-wall being sighted. The strike of the lode is E.N.E., and it makes lenticular masses of ore. Further E. another shaft discloses a similar shoot of ore. The country is favorable, consisting of micaceous and talcose schists, impregnated with thin pipe veins of ferruginous matter.

QUORN COMSTOCK.—Locality, 12 to 14 miles N. from Quorn, and near Mount Arden. A shaft has been sunk 25ft. on a massive outcrop of brown iron ore, supposed to contain silver, the presence of which, however, was not proved. (1888.)

RHINEBERG.—Section 38, hundred of Angas. The secretary supplied the following:—There are two lodes, striking N. and S., about 5ft. wide. Two shafts were sunk and some costeaning done. Specks of galena were found in a soft gossan in micaceous schist country. (1890.)

RHINE VALLEY.—The secretary (April, 1890) stated that this property is on the edge of the Murray Flats, and contains two lodes of an average width of 5ft., with a dip of 45° E. The deepest shaft is 90ft., and a drive of 60ft. has been put in. The lode contains galena in ironstone in micaceous schist country; the ore is patchy. The mine was first opened in 1888, having a good surface show. Assays have been had up to from 30ozs. to 40ozs. silver per ton and 60 per cent. lead.

RIVERSEDGE.—Situated on the banks of the Torrens, 13 miles from Adelaide. It was worked for copper in 1847. A lode of silver-lead was subsequently discovered, and an assay of the ore made at the time by Dr. Davy showed the proportion of silver to be about 627ozs. to the ton of ore. The works were stopped for want of capital.

ROBERTSTOWN.—Locality, about 28 miles from Kapunda, a little E. of N. Early in 1886 a discovery of silver was reported, and from 15 to 20 claims were taken out and worked. Assays were made, and results varying from 3ozs. to 30ozs. of silver

per ton were reported. Numbers of shafts were put down, one to a depth of 100ft. In May the Government Geologist examined the material raised from the shafts and workings, and was unable to detect the presence of any metallic minerals but iron ores and manganese, with two exceptions—Moonta claim and Murphy's claim. In the first there were small quantities of galena and in the second copper. This result, coupled with the absence of vein formation, led to a doubt of the presence of silver in anything like payable quantities. He collected samples, more especially from those points whence good assay returns were said to have been made. These samples—22 in number—were submitted to the Government Assayer, and out of the whole number only one, that from the Moonta claim, yielded any silver. The result was 13dwts. per ton. As far as could be ascertained the men working in the mines had never seen any silver ore in the stone they had been raising, but depended altogether on the "assays," which encouraged them to continue; but much money, time, and labor were wasted in searching for a metal which does not exist in appreciable quantities in this locality. (1886.)

ROYAL KEYNETON.—Hundred of North Rhine, sections 825, 826, and 828. The Inspector of Mines reported (1889) that several shafts had been sunk, none to any great depth; but a main shaft was being put down. The surface is covered by a stratum of limestone, which appears to show synclinal and anticlinal formations, and large nodules of galena, rich in lead and carrying a fair percentage of silver, were observed, but in limited quantity. In the main shaft there is a bed of gypsum with veins of iron and specks of galena in the cleavage, probably deposited by infiltration. In the old workings there is a vein of blende and galena. A great deal of costeaning was done, but nothing was found except nodules of galena enclosed in limestone. There are two ironstone "blows" showing lead, but in small quantity. The mineral indications warrant efforts at development.

ROYAL MINT.—Locality, 3 miles N.E. from Finke's Springs. A prospecting shaft was sunk alongside a large outcrop of iron ore. (1889.) No recent information.

RUFUS.—Situated in Bimbowrie paddock, near Mount Victor, about 12 miles from Teetulp. The Inspector of Mines reported that the ground is favorable for silver-lead lodes, being composed of fine micaceous schist. The claim is opened up to a very limited extent, there being only two pits sunk, each showing a lode formation. A branch on the footwall carries lead ore, a sample of which assayed 10 per cent. lead and 13ozs. 6dwts. silver per ton. Other samples yielded 9ozs. 10dwts. silver and 4grs. of gold per ton. The lode should be followed down on the underlie. (1889.)

SCOTT'S CREEK MINE (also known as "The Wheal Margaret").—Situated about 3 miles from Callington Railway Station and $1\frac{1}{2}$ miles from the Aclare Mine. There is a large formation, which bears N. and S. and dips W. It was leased from the Paringa Mining Company in 1848, and appears to have been worked up to the outbreak of the Victorian goldfields, in 1851. In the old workings it is apparent that a large bunch of ore was taken from about the 7-fathoms to the 15-fathoms level. At this point the lode was contracted to about 1ft. in width by a "horse" of exceedingly hard quartz. There is no record of the amount of ore raised during the first working of the mine. Work was resumed for about six months in a later year under the direction of Captain Price, who supplied the following:—There are three lodes, bearing from N. 10° E. to N. 5° W., and having an underlie of from 18in. to 2ft. in the fathom E.; widths varying from 2ft. to 12ft., and the ores composed of galena mixed with zinc blende, and occasionally small strings of copper ore. The veinstone associated with the metallic minerals is a flinty and very hard quartz, together with a flucan of chlorite on the hanging-wall, with some veins of copper. The country rock is metamorphic slate. The ore, when properly dressed, will assay from 50 per cent. to 60 per cent. of lead and 52ozs. to 80ozs. of silver to the ton. Thirty-five tons of ore yielded, on assay, from 45ozs. to 55ozs. of silver to the ton. Three shafts, the deepest being 15 fathoms, have been sunk to the water-level, and

the drives and levels extend about 200ft. The ore occurs in shoots and small veins of about 3in. thick. Parliamentary Paper No. 83 of 1860 states that Mr. Jno. Bentham Neales first smelted lead by the Cumberland process at this mine in 1850. The first stampers used in the colony were erected on this property, and the first colonial-made pumps and lifters were used to keep the water under. (1887.)

In 1890 the Inspector of Mines reports that, judging from the excavations, a large quantity of lead ore must have been obtained from an irregular lenticular body. In the S. stopes there are veins of ore distributed through a formation of 12ft., but not in anything like payable quantities. Taking the surface indications, it appears as if, where the large mass of ore was found, at least four branches joined, and a further search N. should be made for a continuation. There are some geological features which this mine bears in common with the Aclare in the regular splitting of the lodes, the difference being that in the latter they are S., whilst here they are N. A vertical shaft has been sunk 120ft. on the W. or hanging-wall side of the lode, and a crosscut is now in 43ft. W., intersecting veins of mineralised quartz and galena; but there are no extensive bodies, so that an extension will be required to cut the footwall of the lode. This mine, like others in the neighborhood, can be developed cheaply, and a low-quality ore can be made to yield profits, as there is plenty of water for dressing purposes. The mine is considered worthy of further testing.

SELLICK'S HILL.—Situated $1\frac{1}{2}$ miles E. from Aldinga Bay and 5 miles S. from Aldinga. Silver-lead was found in the hills about 1 mile from the township. Some holes were put down, but no results are on record. The Inspector of Mines reported that the strata consists of a crystalline blue limestone; but W. of the workings there are bands of blue clayey slate, striking S.S.W. and N.N.E. Very little work was done; but gossany iron ore, with veins of calcite were met with. Half a mile S. a large quartzite lode carries specks of galena. Assays from the N. end of the claim are said to have yielded 7ozs. silver to the ton; but the general features of the property do not encourage prospecting. (1889.)

SOUTH AUSTRALIAN BROKEN HILL.—Locality, about 8 miles S.E. from Oulnina woolshed. The Government Geologist reported in June, 1888, a shaft was commenced on a lode striking E.N.E., and underlying to the S. at an angle of about 45°, composed of quartz and oxide of iron, with carbonate of lead and copper. The width varies from 1ft. to 6in. The shaft was not deep enough to show whether the lode is likely to be permanent or not, nor are the surface indications such as to indicate the presence of a large permanent lode. The samples of ore brought from the mine assayed 36ozs. 11dwts., 42ozs., 8ozs. 10dwts., and 11ozs., of silver and a trace of gold per ton. On a subsequent occasion the Inspector of Mines inspected, after which he reported that he did not observe any lead on the mine, nor could he by assay of samples detect the presence of silver or lead. This fact points to the probability that the lode seen by the Government Geologist had either not been followed down or that the mineral deposit he saw had been worked out.

SNUG COVE (Kangaroo Island).—The Inspector of Mines reported (1889) that there are several outcrops on the hillside within a few chains of high-water mark at Snug Cove. In one, lead being found, an underlie shaft was sunk 35ft. carrying the lode down. It strikes E. and W., and dips S. It is a fissure lode, and its constituents favor the occurrence of shoots of lead ore. The enclosing country consists of micaceous slate, and is favorable for the existence of lead lodes.

TALISKER MINE.—This mine, which lies 15 miles S. from Normanville, and about 3 miles N. of Cape Jarvis, was opened about June, 1862, and was worked till about June, 1872. There are four or five lodes, but only one—the Talisker lode—was worked. The bearings of two of them were N. 6° W., and of the others N. 40° E., and the average underlie was about 2ft. per fathom. The width varied from 6in. to 22ft. On the surface the ore consisted of arseniates, phosphates, and carbonates, and at 10 fathoms below the surface, galena. Some of the surface ore went as high as 200ozs. of silver to the ton, but the average of the mine was about 40ozs. of silver. The veinstone associated with the metallic minerals is arsenical pyrites and quartz; in some places zinc blende. The country rock is crystalline schist. Seven shafts

were sunk, the deepest being 432ft., and various drives were put in for a total length of 3,500ft. The ore was found intermixed with quartz, arsenical pyrites, and indurated slate; it was also found in shoots of various lengths and widths. These shoots dipped S. at an angle of about 50°. The arsenical pyrites contained gold, silver, lead, iron, arsenic, and sulphur, and in some places blende; but none of these minerals were in sufficient quantity to pay for extraction. The foregoing information was supplied by Mr. W. H. Price, M.E., and the following is gathered from extracts from a letter in the possession of Messrs. Harry, Harvey, & Co.:—The gross proceeds of silver-lead sold were £29,885 15s., ranging from £27 10s. 9d. to £39 16s. 6d. per ton of 20cwts. The average cost of freight, commission, and all other disbursements in silver-lead sold in London was 6½ per cent. The quantity of silver-lead shipped was 939 pigs and 30,593 ingots, the total weight being 889 tons 4cwts. 0qrs. 4lbs. of 20cwts. to the ton. The percentage of silver contained in the lead ranged from 63ozs. to 91ozs. 13dwts. 20grs. per ton. The lead was sold at £16 12s. 6d. to £22 per ton; the larger quantity at £17 5s. per ton. The silver sold at 5s. 4½d. to 5s. 6d. per ounce, the larger quantity at 5s. 5½d. The lead produced in 1870 contained an average of 69ozs. 12dwts. 11grs.; and in 1871 the average rose to 86ozs. 9dwts. 4grs., being an increase of 23¼ per cent. of silver per ton of lead. The mine stopped working for want of capital. Working having been resumed on this property in 1890, the Inspector of Mines reported upon it, stating that there is a series of lodes on the property, four of which are on section 1554, whilst on Campbell's Creek Mine, now part of the Talisker property, there are three more. On the main lode, known as the Talisker, four shafts have been sunk, and hundreds of feet of drives put in. The width of the lode varies from 12in. to 22ft., and carries the richest ore in shoots dipping S., whilst large pockets of ore make at times into the hanging-wall. These yield many tons of good ore. The composition of the lode is quartz, arsenical pyrites, indurated slate, and galena, and it is very suitable for concentration. From the records obtainable the lead carried 1oz. of silver per unit, so that 50 per cent. of lead would carry 50ozs. of silver, making the present value (1890) £14 10s. per ton on the mine. The situation of the mine gives special facilities for dressing and sending the ore away by sea. The mine being full of water, the Inspector could not examine the underground workings, but quotes Captain Tresize, manager of the Broken Hill Bonanza, who formerly worked in the Talisker Mine, and who states that the ore portions of the main lode carry a good percentage of high-grade argentiferous galena, of much better quality than any of the sulphide ores met with on the Broken Hill Proprietary line of lode; and he has often wondered that so valuable a property was allowed to lie idle so long. The Inspector of Mines again examined the mine in April, 1890, and confirmed his previously expressed conviction of the value of the property. In 1897 a description of work then being carried on stated that the lode in Hale's winze was being sunk upon, a depth of 136ft. having been reached. The lode was 4ft. 6in. wide, containing sulphide ore of good quality. The water in Glyde's shaft, 280ft. deep, was being forked. Operations were shortly afterwards suspended, and no further work has been done on the mine up to date.

THREE BLOCKS.—Oulnina Run, near Mannahill. A wide quartz reef containing galena was sunk upon. It strikes N. and S., and has smooth walls. The percentage of galena it contains is small.

TRINKALENA.—Situated about 16 miles E. from Mannahill. Several shallow shafts have been sunk on a small galena vein. The N. one of these is about 25ft. deep, on a leader composed of quartz, galena, and iron pyrites, 4in. or 5in. thick, stained with copper. The percentage of galena is small. The second shaft, 10ft. deep, is on a vein of galena, with gossany quartz, striking E.N.E. In the third shaft, about 25ft. deep, the vein of galena is larger and richer than that in the other shafts; the wall is also better defined. There are shallow shafts and holes in the neighborhood, but no ore of importance appears to have been obtained from them, nor (in 1888) had any work been done for some time.

UNCLE TOM.—Locality, Mingary. The report by the Inspector of Mines states that near the top of a round hill there is a formation about 3ft. thick, striking N.E. and S.W., with a dip 20° N.W. A vertical shaft, 9ft. deep, had been continued on the underlie 20ft., and a little lead showed, intermixed with mica schist. In open trenches near the shaft several tons of good cubical and steel-grained lead ore were obtained. The costeaning done had not proved the ground properly, but the strata are favorable for permanent lodes. The claim is in a mineralised belt of country, and deserves further and systematic prospecting. A trial of samples by the Government Assayer gave 72½ per cent. of lead and 41ozs. of silver per ton. (1890.)

WATERVALE.—Near to this village a shaft was sunk some years ago 30ft. in brown iron ore, which is simply a bed or capping of iron ore, it contains no silver, and is not a lode. (1889.)

WATSON'S.—Locality, Rose Tennant Paddock, E. from Hawker. The Government Geologist in 1896 examined this prospect, which was on a bar of siliceous, calcareous rock, kaolin, and sandstone, through which specular iron is largely disseminated. No lode formation. Assays showed no trace of silver or gold, and indications warranted only a small amount of prospecting.

WAUKARINGA (Locality of).—A few miles W. of Blackfellow's Reef, some years ago, galena was found in an excavation a few feet deep, on a ferruginous quartz lode. An assay showed that this ore contained 12ozs. 14dwts. 19grs. of silver to the ton.

WEPOWIE AND NILTIBURY.—Locality, 7 miles N.W. from Blinman. The matrix of the ore is quartz and ironstone, and the nature of the country rock is siliceous limestone, with dykes of sandstone, quartzite, and clayslate. The Inspector of Mines reported (1889) that a great deal of work had been done on the claim on two outcrops 100ft. apart. Strike of lode N.N.W. and S.S.E., underlying slightly E. The percentage of lead is high (71½), but the quantity of silver in six samples did not in any instance reach 5ozs. To the W. a shaft sunk 49ft. shows a fair display of argentiferous lead and carbonate of copper. The main lode exhibits lead in patches for 2 miles. Some old workings show massive lead ore. Only intermittent operations on a small scale have been performed here since the workings were originally opened.

WESTERN RIVER.—Locality, near the mouth of the Western River, Kangaroo Island. In 1898 the Government Geologist examined this property, and his report states that open cuts have been made in a quartz formation, which extends E. and W., and in which carbonate of lead of good percentage was found. The metalliferous portion is 1ft. to 2ft. wide. With the exception of one winze sunk in the bottom of the open cut, the lead ore does not appear to have been prospected in depth. There is a fair possibility of the ore exposed in the open cuts continuing downwards. The mine is only in a prospecting stage, though the work was commenced in 1892. Operations have recently been resumed, and the Government Geologist, reporting in July, 1907, states that he considers the prospects very favorable to the existence of large deposits of ore in depth.

WHEEL COGLIN.—This property is 3 miles from Rapid Bay. Several shafts were sunk from 7 fathoms to 35 fathoms in depth. About 70 tons of ore were shipped to England and sold at about £14 per ton. The lodes ranged from 6in. to 2ft. in width, and consisted of barytes, gossan, and silver-lead of good quality. (1887.) No recent records.

WHEEL ELLEN.—Situated on section 2728, Strathalbyn. It was opened in 1857, was in active operation in 1860, and "Austin's Mines of South Australia, 1863," states—"The lode is opened on for a length of 120 fathoms. Six shafts have been sunk to various depths, and levels driven every 10 fathoms. Bassett's shaft is 62 fathoms in depth, and at the 50 the lode is larger than at any other part of the mine. Scott's shaft is sunk 45 fathoms, the bottom going down in galena, and blended with yellow ore. The engine shaft is down 30 fathoms, and fully prepared

for the engine and pit work—now on the ground, and ready to be erected. Spence's shaft has also been sunk 30 fathoms through a large lode of iron gossan, bearing gold for about 22 fathoms, when rich red oxide of copper made its appearance, and in the lowest depth the gossan has given place to mundic containing about 4 per cent. of copper. The N. pit shaft is sunk 22 fathoms, and communicates with Spence's for ventilation."

The following account is compiled from papers supplied by Mr. John Harvey :—The mine is situate on top of a hill 40 fathoms above the bed of the creek. The lode on the back for many fathoms in length is carbonate of lead rich in silver. It is from 4ft. to 5ft. wide on the average and underlying to the E. about 2½ft. to 3ft. in the fathom; the shoots of ore dip N. The ground about the lode is soft white slate, a mixture of clay and mica, and very soft for working. Five shafts have been sunk, namely, the Main, McCourt's, New, Corkscrew, and North. Three of them are sunk to depths of 20 fathoms, 60 fathoms, 40 fathoms, and a number of drives and levels have been put in. About £35,000 was expended on the mine up to the close of the year 1859, of which not more than one-half was for underground work, the remainder of the sum being represented by the purchase and improvement of the property and the building of smelting furnaces, miners' dwellings, machinery, etc. The proceeds during the same period amounted to a net value in England of £20,000. The lode in the 40-fathom level in New shaft averaged about 2½ft. wide, and was composed of galena and zinc blende ores. Ores found in other shafts and workings were galena, zinc blende, mundic, auriferous gossan, and carbonate of lead; also stains of blue and green carbonate of copper. In the North shaft, at a depth of 25 fathoms, a branch of rich copper ore, about 3in. wide, was met with, and at 26 fathoms the width increased to 10in., and consisted of red oxide, black oxide, and grey copper ores. During 18 months' work about 2,000 tons of lead ore were raised, and yielded 90,000ozs. of silver. Specimens of the auriferous gossan, assayed by Messrs. Johnson & Sons, London, yielded gold at the rate of 4ozs. per ton, silver 45½ozs. per ton, and 59 per cent. of lead. The country rock consists of mica schist, micaceous sandstone, and quartzite. The Inspector of Mines reported upon it at the end of 1889, stating that thousands of pounds must have been spent upon it in former years, but though there were raised during one term of 18 months 2,000 tons of ore that yielded on an average 45ozs. silver to the ton, the smelting appliances were so defective that great loss of metal must have been sustained. A piece of lead with slag attached, picked up from the slag heap, produced when tried by the Government Assayer 5ozs. 9dwts. of gold and 269ozs. of silver per ton, and 96 per cent. of lead. The lode has been opened up about 1,000ft. on its course, and hundreds of feet of drives exist in levels from the 10 fathoms to the 60 fathoms. A gossan lode, 2ft. wide, shows in Spence's shaft, which is kindly in character and yields fair prospects for gold. The lode in Bassett's shaft, at the 50-fathom level, holds a large block that would pay for working, and it is composed of quartz, cubical and antimonial galena, and sometimes zinc. The hanging portion of the lode resembles the Aclare ore. The main portion of the lode in this part of the mine has probably not been cut. The auriferous nature of the whole of the lode formation is an important feature. The mine is comparatively untried. It was understood that operations might be resumed, when, by sinking the shafts and opening new levels, and providing dressing machinery suiting the nature of the ores, good returns may be hoped for. Galena from the 50-fathoms level assayed 40 per cent. lead and 24ozs. 13dwts. silver per ton. Gossan and ironstone gave gold as well as silver. (1890.)

WHEEL MARY.—An old silver-lead mine near Normanville. There are several shafts along a N. and S. line. In one or two places there is a little galena in calcspar. There is also some gossany iron ore in the limestone, apparently in cavities. The bedrock is composed of limestone. (1886.)

WHEEL ROSE MINE.—Amalgamated with the Wheel Margaret.

WHEAL TYRELL.—Near Ediacara. In 1888 the Government Geologist reported that two shafts were being sunk on an iron ore outcrop and quartz and ironstone in soft shales and sandstones dipping beneath crystalline limestone. With regard to the outcrops or blows of iron, manganite, quartzite, and other siliceous rocks, there is a general impression that they are all lode outcrops, or form the back of a lode. In many cases, however, this is not so, and they will be found, as they are sunk on, to gradually disappear or thin out into numerous small veins in the rock. The ore in this locality occurs in dolomitic limestone and its joints, in patches, and in a shale formation beneath it. It is possible that larger deposits of this sort exist, though from the nature of the bedrock they may be expected to be uncertain in their occurrence and extent. It would be well to ascertain, by sinking through the limestone into the underlying shales, whether the latter formation continues to be metal-bearing. Only desultory work has been done here. In 1903 a return showed that a shaft had been sunk to a depth of 50ft., to this formation, and drives put in for 100ft. in the shale; 60 tons of ore, worth 40 per cent. lead and 40zs. silver per ton, had been marketed.

WHEELBARROW RANGE.—Near Farrell's Flat there is an old shaft which has been sunk on a quartz vein containing galena to a depth of about 30ft. An assay of the galena returned silver at the rate of 7ozs. per ton. The vein is small, but worth prospecting to a depth of 50ft. or 60ft. on the underlie. Prospecting has been done along the same line for a distance N. for about 1 mile, but beyond traces of galena nothing has been found worth mentioning. (Inspector of Mines, 1889.)

WICKLOW HUT.—Near Franklin Harbor. A shaft has been sunk to a depth of about 30ft. on a decomposed granite dyke 3ft. or 4ft. wide. Thin galena veins have been cut, and can be easily worked, as the rock is soft. Assays made by the Government Assayer gave—Galena (1) per ton, 1oz. 6dwts. 3grs. of silver; (2) 1oz. 6dwts. 3grs.; (3) 1oz. 9dwts. 9grs. (1887.)

WILPENA.—A mineral discovery about 2 miles N.E. of Wilpena Eating-house, was thus reported on by Professor Ulrich:—"A well-defined quartz reef, from 2ft. to 4ft. thick, appears on the W. slope of a low range, traversing fine-grained, slaty sandstone at a strike of N. 36° W., with apparently a vertical or very steep dip E. It shows a strong outcrop for about 11 chains in length, and seems at its S. point of termination, close to a rift in the range, to be faulted for nearly 1½ chains W.; for at that distance, just abreast of the point, commences a piece of reef, about 3 chains in length, identical in mineral character, and which shows the same strike and dip. The crystalline quartz of the main portion of the reef is full of thin strings and small patches, sometimes several cubic inches in size, of galena, in places partially converted into carbonate of lead. Strong copper stains are observable at several points, as also small patches of spathic iron, and there are, besides, enclosed larger and smaller masses of heavy spar, which mostly shows an indistinctly fibrous texture. In the supposed faulted portion the quartz is somewhat sugary in character, but encloses the same minerals as the main portion, heavy spar and copper stains being, perhaps, not so abundant. The slaty sandstone forming the walls of the reef is, a little higher up the range, conformably succeeded by a very hard and dense siliceous limestone, which strikes W. 28° N., and dips S. 28° W. at 30°; and beyond this, near the top of the range, appear two rugged outcrops of quartzite, which show strong copper stains in several places, and are divided by a few feet of friable slate. All considered, its metalliferous indications and geological character render this locality, and more especially the quartz reef, worth a good examination; the latter not so much on account of the lead ore, but because lodes, similarly composed at the outcrop, have frequently been found to carry more valuable ores, as, for instance, bournonite and tetrahedrite lower down." (Ulrich, 1872.)

A fair quantity of lead ore was raised in this locality during 1896, but little or no work seems to have been done here during recent years.

WINCKLER'S.—Locality, 2 miles S.W. from New Luxemburg. During six months ending December 31st, 1898, 62½ tons treated gave a return of 35½ tons of lead and 689ozs. of silver. Deepest shaft, 80ft. Only worked intermittently.

WIRRIALPA.—A discovery of silver-lead ore was some time ago made adjoining the Wirriialpa Mine, 20 miles E. from Blinman, and 6 miles N. from Wirriialpa Station. Captain W. H. James, of Blinman, considered it a most important discovery, and stated that he had traced the outcrop for a distance of from 3 to 4 miles in a direct line. In places quantities of galena and carbonate of lead are visible. (1887.) This mine belonged to the South Australian Mining and Smelting Company, and was under the same management as the Blinman Mine. At the surface galena shows in veins traversing the soft ground, and passes into a crystalline limestone, in which it fills irregular cavities, and forms large masses, each several tons in weight. This main lode strikes in a N.W. direction, and is crossed by another in which barytes is associated with galena and carbonate of lead. A vertical shaft has been sunk 120ft., and at 60ft. both lodes were being driven upon. Though the galena occurs irregularly in the limestone, still it has every appearance of continuing in depth and yielding a good supply of ore. Several other shafts have been sunk on veins of galena and on iron ore with copper. The ore raised is estimated at 60 tons, averaging 70 per cent. of lead and 5ozs. to 8ozs. of silver per ton. The geological formation is the same as that at Blinman, and similar dykes of igneous rock have tilted up the strata, which in many places are twisted and contorted, and vary in dip from horizontal to vertical. It is likely that metalliferous deposits will be found at the junction of the igneous dykes and stratified rocks. (Government Geologist, September, 1888.) The Inspector of Mines reported in 1889 that the surface prospects exhibited galena in ironstone, barytes, and calcspar. There was an underlie shaft going down 50ft. The lode formation was regular, and its constituents were ironstone, quartz, and limestone. A vertical shaft put down 73ft. was not deep enough to strike the lode, but was continued on an underlie 56ft. on what appeared to be lode formation. The locality is favorable, and the mine is well situated, but only large deposits of mineral can be worked at a profit, because of the low value of the ore and the distance from a market. A favorable feature is the entire absence of minerals of a refractory nature. In depth the lead is several ounces per ton better value for silver than at the surface, and the ground is cheaper to work. On the surface large quantities of lead can be seen in the outcrops. A great deal of work has been done, smelters have been erected, and a large quantity of machinery has been placed on the mine. Taking all things into consideration, the mine has been opened up at a moderate cost, and promises to become remunerative.

WINNING HOPE.—About 12 miles N.E. of Wadnaminga township. A shaft had been put down 177ft., a drive from the 100ft. level 180ft., and a winze at the end of the drive 66ft. No intimation of further development or results. (1890.)

The following mining ventures are grouped as having had an existence, and to some extent been worked, but in respect of which no information has been procurable:—

BELTANA COMSTOCK.—Mount Serle Run, near Beltana.

BELTANA EDITH.—Four and a half miles W. of Beltana township.

BELTANA KING.—South of Beltana Broken Hill claims.

BELTANA SOUTH SILVER MINING COMPANY.—Adjoining the above.

BELTANA WINNOWIE.—Near Ediacara.

BLACK HILLS.—Sixteen miles S.E. of Kooringa.

FLINDERS.—Situated at the old Wirriialpa Station, Blinman.

GREAT NEVADA.—Wirriialpa.

JOHN BULL SILVER.—Three miles N.E. of Westward Ho.

JUBILEE.—Twelve miles N.E. of Wirrialpa Silver Mine.

LADY SMITH.—Wilpena.

LAKE TORRENS.—South of Ediacara.

MAMMOTH.—Wallaipa.

MOUNT FREDERICK.—Rhine Valley.

MOUNT JAMES.—Near Beltana.

MOUNT ROEBUCK SILVER MINING COMPANY.—Two mineral claims, 10972 and 10973, 160 acres, at Blinman.

MULDANIPPA HILL.—Near Oulnina.

NONPAREIL.—Oulnina Run.

NORTH GLADSTONE.—Near Great Gladstone.

SPRINGFIELD FREEHOLD.—Sections 921, 1004, and 1076, 240 acres, near the Eagle-on-the-Hill, and adjoining the Eagle Silver Mine.

STANDARD.—Glen Osmond.

TOWITTA.—On sections 157 and 158, hundred of North Rhine.

WHEAL GRAINGER.—Situated 5 miles S.E. from Adelaide.

The subjoined list of silver mines in existence in 1869 shows by prefixed asterisk (*) those which were at work :—*Almanda, *Ben Lomond, Campbell's Creek, *Glen Osmond, *Talisker, *Wheal Coglin, and Wheal Ellen.

GOLD.

The goldfields, or principal auriferous districts of the State, are known by the following local names. Many of these districts cover very large areas, and the positions given are to the central or best-known points.

Barossa (about 8 miles E. from the town of Gawler).—Barossa Diggings, Humbug Scrub, Lady Alice, &c., hundreds Barossa and Para Wirra.

Blumberg and Mount Pleasant (24 to 30 miles N.E. of Adelaide).—Watts' Gully, Blumberg, Mount Torrens, Mount Pleasant, &c., hundreds of Talunga and Para Wirra.

Echunga (20 miles S.E. from Adelaide).—Echunga Diggings, Hahndorf Diggings, Jupiter, Blackwood Gully, &c., hundred Kuitpo.

King's Bluff (4 miles N.W. from Olary Railway Station).—King's Bluff, Outalpa Proprietary, &c.

Mount Grainger (about 8 miles N. from Oodla Wirra Railway Station).—Mount Grainger, Medora, Dustholes, &c., hundred Coghlin.

Mannahill (10 miles N.W. from Mannahill Railway Station).—Westward Ho!, Homeward Bound, &c.

New Luxemburg (14 miles E. from Olary Railway Station).—Lux, Queen Bee, &c.

Teetulpa (about 25 miles N.N.E. from Yunta Railway Station).—Old alluvial and reef workings.

Tarcoola (about 290 miles N.W. by W. from Port Augusta and 120 miles N. from Denial Bay).—Tarcoola Blocks, Curdnatta, Wilgena Enterprise, &c.

Ulooloo (about 6 miles E. from Ulooloo Railway Station).—Alluvial diggings, etc., hundred Hallett.

Woodside (20 miles E. from Adelaide).—Bird-in-Hand, New Era, Ridge, &c., hundred Onkaparinga.

Wadnaminga (23 miles S.E. from Mannahill Railway Station).—Milo, Virginia, Golden Record, &c.

Waukaringa (about 25 miles N.N.W. from Yunta Railway Station).—Alma and Victoria, Alma Extended, Ajax, &c.

For convenience, the records concerning the mines in *Barossa*, *Blumberg* and *Mount Pleasant*, and *Echunga* are classified under the headings of the different hundreds in which they are situated, viz., *Barossa*, *Para Wirra*, *Talunga*, and *Kuitpo*. The information regarding the various workings in the districts of *Tarcoola* (including *Earea Dam* and *Glenloth*), *Mannahill*, *Woodside*, and *Wadnaminga* will be found under those respective headings.

AITCHISON'S CLAIMS.—Locality, sections 81, 82, and 84, hundred of Coomooroo. The Inspector of Mines reported in February, 1895, and recommended that the large lode on 82 should be thoroughly tested. The sample assayed from near the surface gave only 1dwt. of gold per ton; better results might be got at depth.

AJAX (afterwards called "The New Ajax Consolidated," and later "The New Enterprise").—Eight miles S.W. from Waukaringa. A well-defined reef (reports the Inspector of Mines) can be traced for a considerable distance, and had been sunk upon in 10 places, the shafts being from 30ft. to 120ft. deep; course, N.E. and S.W., with an underlie N.W. Formation, layers of ferruginous quartz and chlorite slate. Samples taken gave as high as 1oz. 4dwts. per ton; 100 tons tried at New Alma gave 10dwts. per ton. There was a Government subsidy granted to assist in the development of this property. The secretary (April, 1890) furnished the

following particulars :—The main vertical shaft is down to a depth of 170ft., and the principal underlie shaft 157ft. There are eight other shafts, varying in depth from 20ft. to 80ft. The strike of the lode is N.E. by E., the dip 45° N.W., and the length of the drive 30ft. Width of lode 4ft. 6in., composed of ferruginous quartz and chlorite slate, and the country rock is calcareous slate and sandstone. The ore consists of oxide of iron and quartz, and assays have given results ranging from 10dwts. to 4ozs. 8dwts., 6ozs. 1dwt., and 7ozs. 7dwts. per ton. The Mine Inspector, in June, 1892, reported that a great deal of work had been done. Samples from the shaft and levels (280ft. and 310ft.) returned 13dwts. of gold per ton; a bulk assay had given 1oz. 9dwts. of gold and a trace of silver per ton. In the company's shaft there is a lode 2ft. wide and well defined.

Inspector Matthews reports in April, 1900, the main, or whim, shaft had been sunk to a depth of 355ft., on the underlie of the lode, which strikes N.E., dips N.W. about 2 in 6, and is composed of ferruginous matter, from 6in. to 2ft. thick. This continues to the 240ft. level, and then gives place to pyritic material, which is maintained to the bottom, below water-level, where, it was stated, the lode is from 18in. to 20in. thick. The walls from the surface down are clean and unbroken, and have every appearance of permanency. Two samples taken from the ore dumps gave—280ft. level, 6dwts., and 350ft., 12dwts. per ton, showing a very fair improvement in the gold contents in the last 70ft. sunk. Four other shafts have been sunk to various depths on the line, each showing the lode of the same character, and about the same width. The operations were then confined to the shaft known as the "Company's shaft," about 500ft. S. of the main shaft, and at this point a strong shoot of ore is exposed, the formation ranging in size from 1ft. to 5ft., dipping in a N. direction, and composed of quartz, associated with iron. On this a shaft had been sunk 60ft., and from the bottom a drive 66ft. N. along the lode, and from the end a winze sunk 60ft., making a total depth of 120ft. from the surface. The lode at the bottom is over 4ft. wide, containing, in places, portions of intrusive rock. From the winze a drive has been made for about 20ft., the face having the same appearance as previously described. At 150ft. N. of these workings a shaft is down 87ft.; the lode is similar, and the shaft should be continued until of sufficient depth to connect with the winze; a large amount of ground would thereby be rendered available for stoping. In other parts of the property a considerable amount of work has been done, and battery stone extracted. The crushing completed at the end of February (1900) gave a return of 34ozs. 8dwts. of gold from 50 tons, the tailings being worth 7dwts. per ton. A 10-stamp battery, with a 20 horse-power engine, is erected at the mine, but the inadequate water supply forms the chief difficulty in the way of working the mine on an extensive scale. From present appearances the prospects are very promising. (I.M.R., 30-4-00.)

In September, 1906, a party of tributers raised and forwarded to the Petersburg Cyanide Works a parcel of 125 tons 10cwts., which yielded, by battery and cyanide treatment, 89ozs. 3dwts. 7grs. of gold, valued at £347 19s. 9d., the average extraction being worth £2 15s. per ton. This was considered highly satisfactory; but the heavy expenses of carting, viz., £1 ls. per ton, prevented more ore from being forwarded. Scarcity of water is the difficulty in working the battery on the mine.

ALMA AND VICTORIA.—This mine is situated at Waukaranga, about 25 miles N.N.W. of Yunta Railway Station, and is said to have been the discovery of a shepherd, about 1872. Several companies were floated, but subsequently collapsed, the primary cause of the successive abandonments being the scarcity of water and the expense of cartage. On this mine a very large sum of money has been spent in developments and experiments in the extraction of gold from its matrix. Up to the 31st March, 1890, it was estimated that £142,884 17s. 11d. had been spent on the mine, including £124,375 12s. 10d. paid for wages and materials and working expenses, and £18,509 5s. 1d. on plant, machinery, and buildings; and the quantity of gold obtained was 22,917ozs. 1dwt., valued at £91,747 5s. 4d. The management at that date spoke hopefully of the future of the mine. There are four lodes upon

the property, having a strike of about 15° N. of E., and underlying S. about 30° , with an average width of 5ft. Water-level was reached at 160ft. The ore consists of arsenical pyrites, associated with carbonate of lime and quartz, and occurs in shoots and patches, and the gold is so coated with pyrites as to be indistinguishable. In 1889 the Government Geologist inspected this mine from the surface to the bottom of the workings, about 600ft. on the underlie, where a large reef of pyrites was being stoped underhand. To avoid the disadvantage of working in this manner a new main vertical shaft was in progress. The following treatment was adopted for the extraction of gold:—The crushed ore was run from the stamps into Denny pans, used as concentrators, no quicksilver being placed in them. When these pans had run for some time the heavy pyrites and gold left behind (the fine pyrites and slime having been washed away into settling pits) were taken out, roasted, and amalgamated in a Denny pan. Tailings belonging to previous crushings were also passed through at the same time. Samples of the waste tailings from the pans assayed on the average 1dwt. 8grs. of gold per ton, showing that at the time there was very little loss of gold, and that the concentration was as perfect as need be. It also showed that the ore, which is chiefly pyrites, is not difficult to treat. Specimens of the pyrites from the bottom of the mine were taken at the same time, and found to contain gold at the rate of 8dwts. and 17dwts. per ton. The Inspector of Mines reported that this mine was a very important one, employing on an average 140 hands, and the plant was reducing 300 tons of stone per week. Rock-drills were to be used, and the company proposed to increase their crushing power 50 per cent., a course fully warranted by the quantity of stone in sight. The manager, Mr. Hosking, stated that there were two E. and W. lodes, with a S. underlie of about 32° ; the N. lode 7ft. and the S. lode 2ft. 6in. wide. There were 12 shafts, the two deepest being 1,180ft. and 260ft., and five of these shafts followed the dip of the lode. There were about 6,000ft. of drives in the mine. The matrix is composed of quartz and calcespar, and the country of sandstone with occasional veins of slate. The ore raised consisted of nearly pure sulphides, and the yield during the six months to April, 1890, averaged 15dwts. 7grs. per ton, the gold being worth £4 2s. 8d. per ounce. The mine was yielding only 8dwts. 14½grs. per ton in September, 1894; the lode pinched greatly and then disappeared, and the country was exceedingly hard. Exploratory borings by compressed air drills were made, but no body of ore was discovered; and in December, 1894, the company decided upon winding up. The machinery plant was sold and removed, and the large accumulation of tailings left was treated under the Deebie agitating cyaniding process by Messrs. Rees, Deebie, and James, with satisfactory results. From the first start in 1872 to October 31st, 1894, the working expenses had been £194,291 13s. 6d.; machinery, &c., £30,164 16s. 10d.; total, £224,456 10s. 4d.; gold produce, £180,566 8s. 1d.; dividends paid, £24,000. Gold average, 1889 to 1872, 16dwts. 20grs. per ton, worth £4 1s. 11½d. per ounce.

Samples taken by Messrs. Gee and Grundy in May, 1907, from portions of the lode left standing in the upper workings assayed 3dwts. 15grs. to 1dwt. 3grs.

ALMA EXTENDED.—Locality, Waukaringa, W. and adjoining the Alma and Victoria Gold Mine. There are three lodes upon the property, with an E. and W. strike, one being 3ft. wide, the second averaging 3ft., and the third 5ft. wide. One shaft was put down vertically to a depth of 470ft., and 390ft. of driving was done. The matrix of the gold consists of iron pyrites and quartz. Assays made from time to time yielded very satisfactory results. The Inspector of Mines reported favorably, and gave as the assay of a sample by the Government Assayer 2ozs. 2dwts. of gold and 3dwts. of silver to the ton. The plant (which was large and complete) and construction expenditure on this property to the end of February, 1890, amounted to £8,819 10s. 10d., and wages and materials account reached £9,487 17s. 1d.; total expenditure, £18,307 7s. 11d. In August, 1890, Mr. W. Bell presented a report to the directors, which stated that the gold occurred probably in oblong patches, and that the stone required selection to avoid working at a loss.

He sampled and found in the stone gold up to 1oz. 12dwts. 6grs. per ton, and in six of the 12 parcels nil; raw concentrates, 3ozs. 5dwts. 8grs.; roasted concentrates, 2oz. 9dwts.; tailings from amalgamating pans, 1oz. 9dwts. 9grs.; and slimes, 700yds. from battery, 4dwts. 3grs. per ton. The company stopped working in October, 1892, and wound up in November, 1898.

The mine was renamed the "Glamorgan," and a syndicate was formed for the purpose of thoroughly testing the stone at the various levels, and, if possible, intersecting the main shoot of ore lost in the Alma Mine adjoining, the evidence pointing to the conclusion that all main ore bodies in the original mine trended towards this property. The shaft has been sunk 470ft. vertically, and thence 525ft. on an underlie of 32°, making a total of 995ft. The vertical portion of the shaft passed through three distinct reefs, known as the Pug, Middle, and Bottom reefs, each being about 130ft. apart, their strikes parallel, and having the same underlie. The second, or middle, reef was intersected at the 325ft., or No. 1, level, and here driving and stoping operations were in progress for some time; the lode, in the faces exposed, averaging fully 3ft. wide from wall to wall, composed of quartz, calcite, and arsenical pyrites, strong and well defined. After careful examination the inspector came to the conclusion that the payable or richer portions of the ore body occur in shoots, which should be carefully followed, leaving the more barren portions standing. From a number of assays one portion of the stope for about 40ft. in width gave a result of 1oz. per ton, while on each side of this the average was only between 2dwts. and 3dwts., and it appears that, by taking the full width of the various stopes indiscriminately, the average would be reduced below a payable margin. This should be avoided as far as possible in any future workings. At 470ft., bottom of the vertical portion, the bottom reef was struck, and the shaft continued on the reef underlie; this reef is smaller than the other, and has a less promising appearance. From the 720ft. level a crosscut has been made S., intersecting the middle reef at 129ft., and a drive made a short distance E. along it; it is of the same character and about the same size as described in No. 1 level, and the inspector strongly recommends that this drive be continued some 300ft. or 400ft., for the reason that it is the most permanent-looking reef, the central one, from which the other two could be explored by crosscuts if necessary; and, being about 250ft. deeper than where the gold disappeared in the adjoining mine, the position is good for intercepting any shoots of gold that may exist between the two series of workings. There are other workings in various parts of the mine, but, for the time, it would be advisable to confine operations to stoping ore from the 40ft. shoot at No. 1 level, and driving E. on the lode at 720ft. level. The mine is splendidly equipped with a 20-head battery, winding plant, air compressor, &c. (I.M.R., 1-10-01.)

ALGEBUCKINA.—The Government Geologist examined and prospected a place on the Neales River, where some years before gold was found—a waterhole called Algeuckina, where the Great Northern railway line crosses the Neales, 653 miles from Adelaide. Only a few colors of gold were obtained at the time, but the discoverer, Biddle, continued the search, and succeeded in striking payable gold. As far as can be ascertained, about 60ozs. of gold were got up to March, 1887. During 11 weeks' work a party of three men got 13ozs. of gold; this appears to be the richest result obtained. Colors of gold have been found over an area of country extending from Mount Dutton to Coppertop Hill, a distance of 35 miles. The extent of country available for prospecting is comprised within the Denison, Peake, and other ranges to the N., which outcrop in isolated areas from beneath Mesozoic plains, and along the courses of the Neales and other rivers where they have cut into the bedrock. The auriferous area is therefore comparatively limited. The Government Geologist visited and reported in July, 1889, and expressed a very favorable opinion of the Neales district as a place where auriferous deposits might be found. Later a Government party was sent, as suggested by the Geologist, to bottom certain shafts in the River Neales, Algeuckina. It was reported that

shafts Nos. 1 to 4 were bottomed without meeting any gold except a few fine colors in the course of sinking, and that the water in every case rose to within 4ft. of the surface, making about 3,000galls. per hour after a depth of about 10ft. was reached. They proved the valley for about one-third of its width, and the Government decided to discontinue the workings. The principal place where the alluvial gold was worked is along the conglomerate escarpment bordering the Neales River. Small quantities of this metal were also found up the valley of the Neales and in gullies at Mount Dutton.

At the end of 1898 a syndicate was formed, and a small battery was erected near the Algebuckina Bridge in order to test the large cement deposits on the banks of the Neales. The returns were unsatisfactory and work was discontinued.

During 1897 the Government assisted in prospecting for alluvial gold near Mount Kingston, but without payable results.

ANGASTON.—Workings on section 781, hundred of Moorooroo. The Government Geologist examined this property in 1896, and stated that waterworn gold had been found in a Tertiary conglomerate resembling the Barossa auriferous cement, and also in quartz and ironstone detritus lying upon metamorphic micaceous sandstone and schist bedrock. In the first place examined there was a shaft down 60ft., which, if continued, would most probably come upon auriferous gravel or boulder wash. The debris should be prospected in each place with a dish, to trace the gold to the reef or vein which was its source. On section 777 an ironstone vein containing gold was being prospected, and similar veins and quartz outcrops exist on all the sections. The rock formation of the district generally is favorable to the occurrence of gold and other metallic minerals, and is a continuation of the Blumberg and Mount Pleasant auriferous rocks. Deep leads may possibly exist in the neighborhood.

ANGEPENA TREASURE.—Situated on sections 330 and 331, near Angepena Station. The Government Geologist examined this property in 1896, and reported that on 331 a shaft had been sunk on the underlie of a lode formation 23ft., consisting of ferruginous claystone, with veins of brown iron ore, gossan, and quartz, associated with manganese and carbonate of lime, and a brecciated formation, which appeared to be a part of the lode; no defined hanging-wall reached, though a well-defined footwall is shown. Strike of lode E. 20° S. The country rocks are indurated slate and sandstone and soft clayslates, and flags on the N. side of the lode, which has been deposited along the line of junction of the hard and soft strata. It is not a true lode. An outcrop can be traced along the surface, and samples taken from the formation at shallow depths panned off a little fine gold, indicating the existence of small auriferous veins in the main formation. If the shaft were sunk to a greater depth, the direction and dip of these veins might be ascertained. This formation is likely to continue in depth, in one place it is 10ft. wide; and in another place an excavation shows a formation 4ft. to 5ft. wide, striking E. 20° S., and dipping 55° to 60° N. It is enclosed between hard jointed quartzite, forming a footwall, and softer flags and slates. In section 330 the width of the formation, as seen in the several excavations, varies from 2ft. 6in. to 7ft., and in places where there is an outcrop of hematite, brown iron, and gossan it widens to 12ft. or 14ft. Samples assayed returned either no gold or only a trace. In the previous year the inspector took samples, from which an assay returned 9ozs. 19dwts. of gold and 1oz. 3dwts. of silver per ton.

A parcel of 4 tons 7cwts., treated at Mount Torrens Cyanide Works in July, 1895, returned 17ozs. 10dwts. 3grs. of gold, valued at £69 7s. 5d., an extraction of 4ozs. 0dwts. 11grs. per ton. Subsequently it was alleged the mine had been "salted," and the company working it went into liquidation.

APPLEBY'S (L. 967).—Situate near Mount Grainger. Prospecting shaft sunk near the boundary of the Ironclad Mine, 25ft. deep. Lode material composed of ferruginous slate, with veins of iron-stained siliceous matter. This prospects fairly

well, and will probably improve in depth. In other parts of the property vein croppings are exposed, upon which a little work has been done. The country at the surface is twisted and contorted in a most remarkable manner, making the gold-carrying veins difficult to follow, and in order to prospect the ground thoroughly depth must be attained. (I.M.R., 25-2-01.)

AUREOUS.—Adjoining the Union Jack, near Mount Grainger. On the surface shows a wide formation, consisting of quartz, sandstone, and slate, in which gold has been obtained. Two shafts sunk, one on the underlie, 55ft., and the other vertical, to water-level, 75ft. Various drives and crosscuts made, but no information obtainable. There is apparently a strong quartz lode or vein in the bottom workings, which should be further explored. (I.M.R., 31-8-01).

BALD HILL.—Locality, Cuttlefish Bay, Kangaroo Island. Prospected in 1896, and it was stated that battery crushings yielded 3dwts. of gold per ton; it was also stated that by the Christmas process of extraction 12dwts. per ton was obtained; and 5 tons treated by Haycraft resulted in 15dwts. per ton. In December, 1898, the Government Geologist examined this property, and reported that a shaft had been sunk and a tunnel driven into a large quartz lode, 18ft. to 20ft. wide, near the top of Bald Hill. No gold is visible in the stone, but pyrites show occasionally. The rocks and veinstones are favorable to the occurrence of gold, but samples assayed gave no returns of gold or silver. More surface prospecting advisable.

BALHANNAH.—*Vide* COPPER SECTION, page 23.

BANKSIA MINE (later named the "Associated O.K.")—On section 4261, hundred of Onkaparinga, near Oakbank. Gold has been obtained from a series of more or less parallel leaders, striking N.E. and S.W. and dipping S.W. 45°, through metamorphic, granitic, and argillaceous rocks associated with granite. The veinstone consists of quartz, cellular and ferruginous, iron oxide, and micaceous iron. One shaft is sunk to a depth of about 80ft. Fifteen tons of stone yielded about 11dwts. of gold per ton. Mr. J. C. F. Johnson states that a small crushing of 9 tons gave 9ozs. 6dwts. of gold, and that assays of pyrites from the same claim have given as high as 10ozs. per ton. The Inspector of Mines reported that there are a series of parallel leaders striking nearly E. and W., with a S. dip. Four of these have been opened upon by means of shallow shafts. There is also a large ironstone reef cutting these at right angles, and striking N. and S., with a dip at a low angle to the E. The strata are composed of metamorphic and argillaceous rocks, with granite. The matrices are cellular quartz, iron oxide, micaceous iron, and iron pyrites, the latter assaying very high for gold. Assays of samples taken by the inspector—(1) pyrites, 3ozs. 8dwts. of gold to the ton; (2) ditto, 2ozs. 10dwts.; (3) N. and S. lode, 1oz. 4dwts.; (4) 6ozs. 17dwts.; (5) quartz, 8dwts. In the former working of this mine, 10 tons crushed at New Era Mine yielded 23dwts. per ton; 13 tons crushed at Two-in-the-Bush Mine yielded 13dwts., and 25 tons 16dwts., and another 25 tons 17dwts. per ton; 8 tons crushed at the Bird-in-Hand Mine gave 19dwts. per ton; 25 tons treated at the Eureka Mine gave 14dwts. per ton, and 30 tons 10½dwts. per ton; 5 tons treated at Sandhurst, Victoria, gave 18dwts. per ton. The total of 141 tons yielded 106ozs. 11dwts. of gold, the average being over 15dwt. per ton, and the value of the gold was £3 18s. 10½d. per ounce. In these trials no effort was made to deal with the pyrites, and assays prove that they carry the bulk of the gold. The ground is easy and cheap to work, and seven of the veins have been proved to be gold-bearing. (1889.) For a time operations were resumed in 1895, and work has been carried on intermittently up to June 30th, 1907. Eighteen parcels were sent to the Mount Torrens Battery and Cyanide Works, for treatment; these comprised 219 tons 17cwt. 2qrs., which returned 180ozs. 13dwts. 7grs. of gold valued at £698 11s. 6d., the average yield being worth 63s. per ton. Some of the parcels contained a fair percentage of pyrites rich in gold, but with the battery treatment, followed by the cyanide treatment of the tailings, gave satisfactory results.

BAROSSA, HUNDRED OF.

The Barossa Goldfield is situated in the S.W. corner of the hundred of that name; it is separated from the Humbug Scrub goldfields (hundred of Para Wirra) only by the South Para River, which latter is also included in the geological map of the district. It was discovered in October, 1868, by Job Harris and mates, who found gold in the gully now known as Spike Gully, which is about $1\frac{1}{2}$ miles long—the prospectors' claim being near the middle. The depth of sinking was from 5ft. to 20ft., and some of the claims were very rich, yielding as much as £1,000 per man. In an official return, dated July 31st, 1871, by the then Warden of Goldfields (*vide Gazette*, August 10th, 1871), the value of gold found on this field, from 1868 to 1871, was estimated at £180,000. The price paid by the bank was at the rate of £3 17s. per ounce.

The general features are a main rocky range, running from N. to S., of which Mount Gawler, near the S. end, attains a height above the sea of 1,789ft. This range is flanked on either side by patches of Tertiary deposits, on the spurs between which the gullies descend gently into Malcolm's Creek on the E., and through steep rocky gorges into the Little Para, Gould's, and Tenafeate creeks on the W. The N. end of the reserve, in Barossa, is divided from that in Para Wirra by the deep rough gorge of the South Para River. Here the main ridge runs N.W. and S.E., following the course of the river, and being capped on its highest part by Tertiary beds, with its small steep gullies running S. into the Para River, and N. down a gentle incline into the Yetti Creek.

The Rocks of this district are supposed to be of lower Silurian age, from their lithological resemblance to those of the Victorian goldfields; although from their highly metamorphic appearance, and no fossils having been found, it is impossible to say decidedly of what age they are. In several places intrusive granite dykes are met with, and in one particular line, from Malcolm's creek to Mount Gawler, they are very frequent. These rocks consist of metamorphic, argillaceous, and micaceous schists, slates, sandstones, and grits, granite, gneiss, hornblende schist, mica schist and quartzites with granite, greenstone, and felspathic dykes. As a rule they have a uniform strike of about 20° E. of N., and dip to the E. from 35° to 70° ; the only exception to this rule seems to be near the Bismarck diggings, in the hundred of Para Wirra, where the dip is 70° W. in two places; but this is probably caused by local agency, as it does not extend far. Nearly all the rocks of this district, especially on the ridges, have so highly a weathered appearance and are so decomposed that they might often be taken for Tertiary cements, particularly some coarse-grained metamorphic granites, which contain a great deal of iron. The only place where the rocks are not highly altered is along the Yetti Creek, where they consist of sandstones and slates.

Pliocene Leads, Deep Leads, or Made Ground.—During the Tertiary period, the main range was out of water; but two main streams flowed, one on each flank, into which small gullies probably ran. Both these creeks flowed N., as is proved by the level of their old beds descending in that direction. The one on the E. side seems to have risen somewhere near Mount Gawler, thence flowing in a N. direction, its course being now traced by a few outlying patches of made ground, and by a general line of low country crossing the present creeks. The other had its rise somewhere to the S., and passed on the W. side of Mount Gawler, and flowed N. towards the Humbug Scrub, where, at the head of Leg of Mutton Gully, it was joined by the E. stream. Thus increased in size it flowed across the present river to the Barossa Goldfield, and so on in a N.W. direction to Gawler, where it discharged itself into the sea. This is deduced from the position of outlying patches of Tertiary gravel, sand, and clay, which have escaped denudation. These deposits constitute the old gold drifts from which a considerable amount of gold has been obtained in Barossa, and a smaller amount in Para Wirra. As the payable portion of these gold drifts can only be ascertained by sinking shafts—often through hard conglomerate, the gold occurring in gutters beneath—a considerable amount of labor

has to be done before a run of gold is struck ; in consequence a large area, consisting of patches of this Pliocene Tertiary, have not yet been prospected by the gold miner. Here and there a hole has been put down, but only in a random manner ; and the ground still remains unproved.

The patches of old gold drift, which are known as "made hills," are generally characterised by ferruginous sandstone and conglomerate capping, called cement, which, being very hard, has protected the softer beds of sand, pipeclay, and gravel from being washed away.

In some cases the lower beds have also been cemented, in which case crushing mills had to be employed to obtain the gold. (Government Geologist, 10-12-1885.)

Barossa Cement.—The Government Geologist having reported, in 1898, that the auriferous cement deposits on the Crown lands at Goddard's Hill were worth testing, the Minister of Mines ordered a test to be made. The total result from treatment by battery and cyanide process was—

Tons cwts.			Ozs. dwts. grs.			
24	0	yielded	10	2	0	gold }
29	0	"	8	12	7	" }
45	10	"	12	10	2	" }
98	10		31	4	9	

Mount Torrens Government plant.

Petersburg Government plant.

In a memo, dated January 20th, 1905, the Government Geologist states that this deposit is appreciably auriferous at certain points only, near the junction of the cement with the bedrock, the payable gold being confined to a layer from 1ft. to 2ft. thick at the bottom of the deposit, where it has accumulated in "runs." The upper portion of the cement contains gold, but in small proportions only, and consequently it cannot be worked in bulk. It has already been proved by the crushing and treatment of 98½ tons at Mount Torrens and Petersburg that auriferous cement can be selected and mined from certain parts of the deposits yielding gold at the rate of 6dwts. 6grs. per ton, which, with a plant on the ground, might be made payable. (Government Geologist, 20-1-05.)

Barossa Deep Leads were the then richest diggings discovered in South Australia ; they are situated at the head and down the side of Spike Gully. The following are some of the most important :—

Cottier's Hill Lead crosses Moonta Gully and Moonta Hill, in the direction of Yetti Creek. It started from the surface, going down into deep ground in ledges. There it was rich, yielding as much as 8ozs. to 9ozs. to the tub ; but it gradually became poorer as it crossed the gully, and did not pay to work far into the Moonta Hill.

Edwards' Rush.—Two or three claims paid very well ; but as the washdirt was cemented, it had to be crushed.

Enterprise.—Section 574. In 1886 Clode and Gaston, prospectors, found alluvial gold in a gutter. A deep lead was believed to exist in a gully running N. and S., and companies were formed, and a large number of claims were pegged. A vast quantity of water and drift were met with in sinking, and two of the companies amalgamated, procured machinery, obtained three small subsidies from the Government, and did excellent work. But, though the existence of a deep lead was proved, the difficulty of coping with the water and drift-sand was beyond all available resources, and the undertaking, with its timbered shafts and drives underneath the deep lead, was reluctantly abandoned.

Goddard's Hill is on a spur between Nuggety and Gollop's gullies. The lead splits in two, one point coming down the point of the hill, whilst the other goes into Gollop's Gully.

Green Hill Lead, on the ridge between Green Hill Gully and Spike Gully, runs in a N.E. direction into the Red Hill.

Hatche's Hill Lead, or Deep Lead, is a continuation of Victoria Hill Lead, but is not so rich, though it paid very well down to Water Flat, where there are some springs. Here the lead was lost, but lower down, where it ran into Walkervale Gully, it was again payable for a short distance. The deepest sinking—120ft.—was on the ridge at the head of Spike Gully.

Melville's Rush is situated about a mile from Williamstown. It starts on the main ridge, and winds down a small spur in the direction of Victoria Creek. The sinking was very hard, and the depth ranged from 15ft. to 20ft. All the washdirt had to be crushed, and, except in the case of one or two claims, did not pay well.

Red Hill Lead, between Two-Speck and Nuggety gullies, is a continuation of Simmons' and White Leads.

Simmons' Lead lies between the heads of Spike Gully and Two-Speck Gully; evidently a continuation of White Lead.

Victoria Hill, S.E. from Spike Gully. The sinking was from 70ft. to 80ft. deep, and as much as 11ozs. 14dwts. of gold was taken off the bottom of a shaft, the largest piece of gold being 7ozs. in weight. The Inspector of Mines (Rosewarne) expressed the opinion that the reefs would probably become gold-bearing in depth to a payable degree, but so far they were not continuous or regular. There had not been any systematic mining, though work had been carried on for years. In connection with an application for a subsidy, the Inspector of Mines reported (November, 1890) that the property consisted of four amalgamated reef claims. A number of pits, and an underlie shaft 60ft. deep had been sunk on some small segregated veins of ironstone and quartz in soft sandstone and micaceous schist. It was stated that 100ozs. of gold had been taken out from the old workings. S.E. of the underlie shaft is a main vertical shaft, 150ft. deep, at the bottom of which the micaceous schist is stained with carbonate of copper. A crosscut N.W. was advised, to prove whether the veins continued in depth.

White Lead is situated between the head of Spike Gully and the road, and is cut through by several small gullies. The sinking is very hard, being nearly all through cement, with layers of sand between; and as the washdirt was also cemented, batteries had to be erected for crushing. Some of the cement yielded as high as 13ozs. to 14ozs. to the ton. The depth of sinking varied from 5ft. to 60ft., according as the shafts were situated either on the top of a spur or near the edge of one of the small gullies. The thickness of the washdirt varied from 2in. to 8in.

The alluvial diggings of this goldfield are very limited in extent, and seem generally to have derived their gold from the deep leads which they had cut through. The most important on the Barossa side are:—

Bullocky Gully, which was thoroughly worked, but was not payable.

Gollop's Gully, also very rich at the part where it spreads out into a little flat.

Green Hill Gully paid to work for the distance of a few chains below Green Hill Lead.

Hissey's Gully paid very well, although most of the washdirt had to be crushed. The depth of the sinking was from 15ft. to 30ft.

Moonta Gully paid very well.

Nuggety Gully was very payable, and yielded nuggets up to 1oz. in weight.

Spike Gully, where gold was first discovered in soft ground at depths of from 5ft. to 20ft. The gold was nuggety, ragged, and smooth. Some of the claims were very rich, a single one having yielded as much as £1,000.

Two-Speck Gully paid to work from Spike Gully to Green Hill.

Sim's Rush.—Early in 1887 a discovery of alluvial gold was made on sections Nos. 574 and 1103, near the junction of Spike Gully and Yetti Creek. The gold was found in ordinary alluvium, which increased in depth to the N., and also in an old lead, being a continuation of that which was previously worked between Yetti Creek and Spike Gully. Some of the claims were sunk to a depth of 25ft., but great difficulty was experienced owing to the strong influx of water. An extension of the lead may be looked for to the N., where the surface indicates an area of similar

"made" ground. Patches of this are found on many of the hills in the neighborhood. The trend of the newer or alluvial lead, worked in Sim's paddock, is probably down the Yetti Creek into the South Para River. It is impossible to state the amount of gold obtained from these diggings owing to the reticence of the miners and the owners of the property. The rocks of the neighborhood are white kaolinised clayslates, quartzose sandstones, and metamorphic granite.

BAROSSA REEFS.—A good deal of work has been done on these reefs, though little success has been experienced. In some instances this has been due to want of system; in others, even where the prospects were good, the enterprise has been abandoned for some unknown reason; and in other instances, again, payable shoots of gold have not been followed, and vertical shafts have been sunk, striking the reef in a barren part.

Auburn.—Some claims were taken up on Goddard's Hill, where a shaft was sunk 110ft. At 60ft. it passed through some gold-bearing leaders, but these were not followed. A shaft was sunk to a depth of 80ft. or 90ft. in 1869, between Two-Speck and Nuggety Gullies, but no gold was obtained.

Moonta Hill.—The first auriferous reef was found here. As far as was worked, it was not payable.

Barossa Junction.—In this claim an open cut has been run 90ft. into the hill, and at the end there is a shaft 30ft. deep sunk on a quartz reef, 3ft. to 4ft. wide, said to carry fine gold; a winze shows that the reef dips E. Another shaft, three chains away, is down 36ft., and the reef is stated to be 4ft. to 5ft. wide; and another shaft is down 27ft. (1896.)

Barossa Treasure.—A syndicate put down a shaft 115ft., and a leader passed through gave a high assay.

Belle of Barossa.—Several shafts put down from 10ft. to 80ft. deep, from one of which rich specimens were taken. Two distinct reefs worked. (1896.)

Breakell & Company, in 1882, put a tunnel 80ft. in length into Goddard's Hill, but got nothing. In 1882 they extended the tunnel to a length of 500ft.; they sank a shaft on Cotter's Hill to a depth of 100ft., and in driving to the W. cut a flat reef 9ft. thick, but in neither case was gold obtained.

Buckerfield & Co.—This lies N.W. of the Treasure. A shaft has been put down to the depth of 90ft. on the underlie; some of the stone raised carried gold.

Lady Pearce, afterwards amalgamated with Menzies Barossa.—Locality, sections 429 and 430, hundred of Barossa. The Government Geologist examined this mine in March, 1896. The chief workings then consisted of two tunnels and a shaft in a steep spur 400ft. high, margining the South Para River. There is a reef varying from a few inches to 3ft. or 4ft. in width. The country rock consists of decomposed granite and metamorphic, argillaceous, and talcose granitic schist and slate. Alluvial gold has been obtained in the river below. The drives are in greenish serpentinous granite, with veins of quartz, specular iron, clay, and gossan. The strike of the formation or reef is a little W. of N. in No. 1 tunnel, and in No. 2 it is N. and S., dipping at a low angle E. Specimens of gold obtained from rich shoots in the reefs were shown. Further prospecting is required to test whether the stone would prove payable before any machinery was set up. A crushing of 4 tons at Gawler was said to have yielded 8ozs. 13dwts. of gold.

Lyndoch.—On section 3250, near Lyndoch, the Government Geologist noted in 1889 that two men sinking through the Tertiary drifts were obtaining a little gold in the cemented quartz gravel and boulders overlying the bedrock. The sinking was about 30ft. and dry, but the results were not payable, though it appeared probable that payable gold would be obtained when a deeper run of ground was met with.

Lyndoch Valley.—The property is on section 54, Barossa, and the Government Geologist reported upon it in September, 1898, to the effect that some quartz lodes are exposed penetrating an outcrop of quartzose sandstone. In an open cut a lode formation shows quartz associated with argillaceous siliceous ferruginous material, and containing blue and green carbonate of copper and pyrites. It has a very

favorable appearance for gold, is 6ft. or 7ft. thick in places, and looks like the cap of a permanent lode. Samples taken from the lode and tailings showed gold and silver up to 4dwts. of the former and 12dwts. of the latter. Judging by the results from the tailings, it is probable that gold in payable quantities was obtained in the old workings, which it is said reached to a depth of 160ft. Later in the same year the mine was put into voluntary liquidation, though crushings yielding an 8dwts. return per ton had been obtained.

McRobie's.—Sections 159 and 200, hundred of Barossa, situated on the old Barossa Goldfields, 9 miles from Gawler. The workings are on rising ground, almost surrounded by a deep watercourse, with hills rising abruptly on either side. A large number of shafts were sunk in search of alluvial gold, a considerable time back, with probably very fair results. The sinking was from 10ft. to 30ft., the gold being obtained from quartz, gravel, and clay material, on a pipeclay bottom. With the object of lode-prospecting, three shafts have been sunk, two to the depth of 60ft. each, and one to 70ft. From the material on the surface raised from the former little is exposed beyond the pipeclay formation; in the latter, the rock is ferruginous claystone, containing small seams of iron-stained quartz, but nothing to enable an opinion to be formed as to the existence of a lode formation. The country is auriferous, and from its general character it is more than probable that beneath the alluvial quartz lodes or veins exist; but as no work was in progress, and the old underground workings could not be inspected, no definite idea could be formed; and for the purpose of determining the matter it will be necessary to sink a series of small shafts, crossing the supposed line of lode, and connecting them by drives a few feet below the alluvial formation. Two samples from the 70ft. shaft assayed, one, 1dwt. of gold per ton, and the other nil. (I.M.R., 24-1-00.)

Menzie's Barossa, previously "Royal Phoenix."—In 1896 workings had been confined to one reef, though it was stated that there were eight others in the property. The ore consists of gossan and ferruginous quartz in a 6ft. reef, which has been opened at the end of the tunnel. The original Menzie's Barossa Company, after existing six months, amalgamated with the Lady Pearce, and the total holding was about 100 acres. In March, 1897, a trial parcel of 23 tons 14cwts. was treated at the Mount Torrens Cyanide Works, and returned 15ozs. 1dwt. 14grs. of gold—a yield per ton of 12dwts. 17grs. A 40-head battery was afterwards erected by the company at the mine. Operations were carried on principally on the Lady Pearce blocks, but the results of crushings proved very unsatisfactory. Some special tests were made with a parcel of 206 tons of stone, and the yield was only 3dwts. 23grs. per ton, with 19grs. per ton in the tailings.

Acceding to a request made by the directors to the Hon. Minister, the Government Geologist in May, 1898, furnished the following report:—

The workings comprise the Lady Pearce tunnel, No. 2 tunnel, the transverse tunnel and stopes, the Phoenix tunnel, winze tunnel, the north tunnel, and the main shaft.

The Lady Pearce Tunnel.—The entrance of this tunnel is a few feet from the South Para River, at an elevation of 21ft. above it, and it has been driven into the hill for a distance of 580ft. in a general direction of N. 15° W.; 146ft. from the entrance a drive branches off to the right for a distance of 30ft., and then runs roughly parallel to the main tunnel for 98ft. At the extreme end of the main tunnel the lode consists of rubby quartz and gossan 1ft. 6in. thick, and at 7ft. from the end there is a bunch of quartz with gossan 4ft. thick. At 17ft. the quartz is 3ft. thick; from this point the lode consists of irregular bunches of hard quartz with vughs, varying in thickness from 3ft. to 4ft., this thins out at 150ft. into small quartz veins traversing kaolinised granite rock; 100ft. further, at a point where a rise has been put up, the lode makes again; it consists chiefly of quartz, varying in thickness from 3ft. to 4ft., between well-defined walls, dipping 40° E.N.E. From this rise, outwards along the tunnel, the lode thins out to 1ft. 8in. and 1ft., occasionally widening out for short distances to 2ft., 3ft., and 4ft. At 100ft. from the entrance it thins out into small veins from 1in. to 3in. thick. In the branch drive a quartz lode has been followed. In the face of this drive there is a formation 3ft. thick composed of quartz, with vughs, containing gossan and brown iron ore, with kaolinised country rock; it is not well defined. In this drive a little stoping has been done. Near the junction of the drives there is a bunch of quartz 3ft. thick, elsewhere the lode thins out either entirely or exists only as a thin vein. The quartz vein and formation driven on here appears to be a separate vein on a branch of the main lode; it dips in the same direction as the latter, but at rather a lower angle. The general strike of the main

lode is N. 15° W., and dip from 35° to 40° E.N.E. Twenty-nine samples taken along the course were assayed; two of these returned gold at the rate of 4dwts. 12grs. and 1dwt. 3grs. respectively, the remainder contained traces (less than 1dwt. per ton). Traces of silver were present, and a trace of copper in one instance.

No. 2 Tunnel.—The entrance to this tunnel is 40ft. above the Lady Pearce tunnel, and 40ft. to the E. It has been driven 160ft. on a lode formation consisting of quartz, ironstone, kaolin, and decomposed rock from 3ft. to 5ft. in thickness. It has a well-defined footwall dipping 45° E.N.E., and is evidently a continuation upwards of the lode in the Lady Pearce tunnel. Nine samples taken along the course of the lode were assayed. Two of these contained gold at the rate of 18dwts. 10grs. and 1dwt. 8grs. per ton respectively. The remainder contained traces only.

The Transverse Reer.—The workings comprise an open cut along the outcrop, a tunnel on the course of the lode, and stopes between them. The open cut, which is 135ft. long, has been made on an outcrop of metamorphic argillaceous sandstone, with intruded granitic veins, traversed by small veins, bunches, and cross-veins of quartz with iron ore and gossan. S.E. it is connected with the tunnel at a depth of 34ft. below the surface. Along the border of these stopes and from the open cut downwards portions of the lode formation are visible. In the upper portion the walls are about 5ft. apart, and have between them a broken lode formation. Lower down this thins out to a foot and less. The footwall dips 59° N.E. The tunnel has been driven 310ft. In the N.E. end or face there is a quartz vein from 3in. to 1ft. in thickness, dipping N.E. 45° in a lode formation 2ft. thick between smooth walls. A lode of rubbly quartz, pug, and iron-stained quartz, from 6in. to 2ft. thick, extends for 34ft. to the N. limit of the stopes, thence along the tunnel for 40ft.; it has a thickness of 2ft. and 3ft. in places. At 113ft. from the face a winze has been sunk at an inclination of 45° to a depth of 48ft. on a smooth well-defined wall, with pug casing, but carrying no veinstone. At the bottom of this winze there is a small vein of quartz. Ten feet from this winze the lode again makes, attaining a thickness of 3ft. in places for 30ft., but afterwards thinning out and becoming broken up. The walls continue on to within 40ft. of the tunnel entrance. Eleven samples of the lode taken from different places, in the borders of the stopes and in the tunnel below, returned only traces of gold. Of these eight were rough averages of the lode and formation, and three were special samples of veinstone, which appeared likely to contain gold. These results indicate that the lode so far opened up is not payable. There is no reason, however, why better auriferous stone may not be found by prospecting at greater depths.

Winze Tunnel.—This tunnel is 80ft. in length. A small lode composed of quartz, with brown iron ore and gossan, is exposed in three or four places along it. In the face the vein is 6in. to 8in. thick, about midway 7in., and at the winze 1ft. 6in. thick. A winze has been sunk on an incline of 48° 17ft. from the entrance of the tunnel. In the winze quartz 2ft. thick is showing, about 15ft. down. A crosscut has been put in from the S. side, which has met with a body of quartz and ironstone from 1ft. 6in. to 3ft. thick, which, however, only extends 15ft. or 20ft. in that direction. It dips 35°. From its position in relation to the winze I believe it to be a different vein to the one sunk on in the winze. As this winze contained a quantity of water I was unable to examine it below the depth of 35ft. The veinstone is quartz, containing brown iron ore, specular iron, and gossan. Average samples of the lode, taken from seven places where the veinstone was exposed in this tunnel and the winze to a depth of 35ft., on assay returned only traces of gold.

The Phoenix Tunnel.—This tunnel, the entrance of which is opposite to and within 25ft. of the winze tunnel, is 280ft. long, and has been driven on the course of a lode of variable and irregular thickness and strike for that distance. In the face there is a vein of quartz and iron ore 3in. to 6in. thick, dipping from 20° to 40° N.E. For a distance of 130ft. no defined lode is visible, merely small veins of quartz, rubbly quartz, &c., from 4in. to 9in. in thickness, except in one place, where it is 20in. thick. At 145ft. a crosscut put in 158ft. has met with no veins or lode formation. Near the junction of this crosscut with the tunnel the lode splits into two veins, varying respectively in thickness from 9in. to 12in., and from 6in. to 20in. At 160ft. a winze has been sunk at an angle of 43° on the lode. At a depth of 60ft. the quartz and ferruginous veinstone is 3ft. thick, and has been stoped for a few feet on each side. I was unable to examine further, as the winze contained water and was unsafe. In the tunnel above this winze the lode has been stoped out to a limited extent, the portion left varying from 4in. to 2ft. in thickness, the dip of the footwall being 28° E. From the top of the winze for 20ft. the lode has a thickness of 2½ft.; 50ft. from the winze a second winze has been sunk. This, however, is nearly full of water. The lode here is 2½ft. thick, and dips E. at 54°. From this point a small quartz lode, having a thickness of 3½ft. to 4ft. in one place, extends to the mouth of the tunnel. Average and special samples of the lode taken from 16 places along its course returned only traces of gold. Three of these returned silver at the rate of 2dwts. 10grs. per ton.

The Main Shaft.—This shaft is 214ft. deep, and is vertical. At the bottom a large chamber or plat has been made on the W. side, from which drives radiate in three directions. One of these drives has followed a rough wall for 57ft. in a S. direction, afterwards bending round to the W., in which direction it has exposed a small quartz vein some 2in. thick on the right and a pug vein on the left, finally ending against a vertical wall, on which is disposed a formation of black and greenish steatitic slate, without any quartz or other veinstone. The second drive has been put in W. for 80ft., and has passed through a wall and slaty formation of 20ft. Beyond this point

it is filled with mullock, and consequently could not be examined. The third drive extends N. for 34ft., and has walls on each side, but these carry no veinstone. At 34ft. it branches into two drives, one going N.E., the other N.W. The N.E. drive extends 37ft., and follows the same walls. At the end there is a rise or jump-up, which, being in a dangerous condition, I did not examine. The N.W. drive extends 48ft. It also follows two walls, on one of which a little quartz is visible. In the end is a small lode formation composed of pug and quartz deposited on one of the walls. The operations at this shaft appear to have been confined to following the various walls met with, in the expectation of them leading to a lode. One of the objects aimed at was probably the cutting of the lode met with in the Phoenix tunnel. By continuing the N.W. drive another 30ft., the shoot of stone followed down in the winze of the Winze tunnel should be met with if continuous. Three samples of veinstone and formation occurring in connection with the walls driven on from the bottom of the main shaft returned, on assay, traces of gold only.

North Tunnel.—This tunnel has cut a quartz lode at a distance of 190ft. from the mouth, and has been driven along it in a S. direction for 64ft. The lode consists of quartz and iron oxides, including micaceous iron. At the face it dips 49°, and where first cut 40°, to the W. The thickness of the lode, where visible, is from 2ft. 10in. to 3ft. 6in. Average samples from four places on this quartz lode returned, on assay, traces of gold.

The Country Rocks.—The rock formations consist of argillaceous sandstone and grit, argillaceous and talcose and hornblende slates and sandstones, quartzose sandstone and grit, &c., dipping at high angles—from vertical to 45°—and striking into which pegmatic and other granite dykes and veins have been intruded. In the neighborhood of these dykes the sedimentary rocks are highly metamorphosed, in some places being hard and crystalline, in others soft and decomposed.

In my report of the Lady Pearce workings, dated March 19th, 1896, which workings are now included in the Menzies Barossa Mine, I pointed out that the gold occurred in the stone in shoots, and recommended exploring these by sinking and driving, and by having trial crushings made from each place before erecting machinery for treating the ore.

The work done since 1896 has not developed any different conditions with regard to the lodes. The specimens of quartz containing gold found apparently come from small veins and crossveins, and not from the larger lodes with which they are associated. The occurrence of such small veins or leaders rich in gold is a feature in connection with gold-mining in the Barossa district.

These facts, however, should not prevent deeper prospecting of these lodes by winzes and drives. The conclusions I have arrived at are:—

1. That the lodes, so far as opened up, are too poor in gold to yield payable returns by crushing all the material contained in the lodes.
2. That the quantity of veinstone disclosed by the operations hitherto carried on is too limited to supply material sufficient to keep the extensive crushing plant erected here employed.
3. That a great error has been made in erecting a large crushing plant, and sinking a main shaft, before the lodes had been thoroughly prospected and their value ascertained.
4. Had frequent reliable tests of the value of the lodes been made from time to time, by assays and dish-prospecting, or by the crushing of small parcels of stone, it would have been known that the ore was not rich enough to be payable when treated in bulk.

An attempt at reconstruction having failed, the company holding the property went into liquidation.

Menzie's Barossa North (Horseshoe Bend).—Situated N. of Menzie's Barossa. In 1896 one shaft was down 70ft., and there were several shallow shafts. It was stated that there are seven reefs in the property, and that assays of prospectors' samples returned 5ozs. of gold per ton. Copper ore was afterwards found at this place.

Malcolm's Barossa (Barossa Redemption) was discovered in 1871. There is a large vertical sandstone reef, about 15ft. wide, with small leaders of quartz. The main shaft was sunk 200ft., and at 80ft. a leader carrying gold and 20 per cent. of copper was struck. At the bottom of the main shaft a 200ft. drive was put in to the E., and a non-auriferous reef was cut. Another shaft to the S. of the main shaft was sunk 150ft.

Phoenix Reef.—A discovery of auriferous stone in this reef was reported in September, 1895. A parcel of 11 tons 15cwt., treated at the Petersburg Cyanide Works in September, 1905, gave a return of 10dwts. 18grs. of gold per ton, equivalent to 36s. per ton.

Red Hill.—About 1868 this proprietary sank a shaft 120ft. on a vertical reef. At 70ft. they got good prospects, and sent a crushing to Adelaide, but the returns not being so good as had been expected, the mine was stopped. In 1882 the ground was again taken up. Three shafts, of depths ranging from 60ft. to 70ft., were sunk, but without successful results.

Rosman & Company, in 1882, took up some claims in Gollop's Gully, and opened out on a reef 3ft. or 4ft. thick. They also sank a shaft 40ft. on the same reef, and took out a crushing, but it was not payable.

Victoria was taken up in 1884. From stone found on the surface, and crushed, 35ozs. of gold were obtained. The reef first found was followed down 40ft.; a vertical shaft was sunk 150ft. to the E., but failed to cut it. A drive to the E. through very hard ground was, in 1886, put in to meet it. There are two reefs, one striking almost due N. and the other N.E.; both dip to the E. The prospects washed from the stone taken were very good, and proved that the reefs were worthy of being tested in a systematic manner. The rocks are feldspathic slates and schists, sandstone, quartzite, and grit.

Wheal Francis.—In 1896 there was a shaft down 140ft., a drive 20ft., and a reef 3ft. wide, and the stone crushed and panned, it was stated, showed gold freely.

Williamstown.—One and a half miles S. of. Section No. 996. In March, 1907, Inspector Matthews reported on a gold find made at this place, where a little prospecting had been done and some gold found about 40 years ago. The present workings are on the top of a hill about 100ft. above the level of the plain, and consist of several small holes, 10ft. to 12ft. deep, and a considerable amount of driving over an area of about 150ft. square. These disclose from 4ft. to 5ft. of wash, consisting of clay and water-worn quartz boulders, large and small, resting on a pipeclay formation, and very much resembling the bed of an old watercourse. A puddling machine has been constructed, and recently about 50 loads of wash have been treated, the concentrates being 12 to 14 loads, and a sample of these concentrates, when washed, gave a return of about 6dwts. of gold per load, and a fair quantity of rutile. Another sample taken from the bottom of the puddling machine gave much better results, probably from 15dwts. to 20dwts. per load, but the Inspector lays stress upon the fact that these results represent the concentrated material—not the crude wash. He considers that there is nothing here to warrant sensational reports, and says that the better portion of the wash seems to lie 12in. or 18in. above the bottom. (I.M.R., 5-3-07.)

BENDLEBY.—Mineral claims (abandoned) in the hundred of Bendleby. A quartz leader has been followed down 50ft., the matrix copper-stained, but lode poor; N. of the shaft is a strong quartz outcrop traceable for miles, and likely to carry gold, but nothing has been found.

BIG BEOW.—Situated about 4 miles N.E. from Outalpa sheep station. There are two rugged outcrops of conglomerate. Sample from depth of 20ft. contained no mineral; the surface quartz and pyrites yielded 16grs. of gold per ten. (Inspector of Mines, 1889.)

BILLY SPRINGS.—Near Mount Fitton. About 1 mile S. of the springs some digging has been done in shallow ground, having a limestone bottom, strewn with quartz wash from a large reef a little to the E. Gold has been found here. The samples seen in 1884 were coarse and rough, and showed no signs of being water-worn.

BLACKFELLOWS' REEF, in the Waukaringa district, is said to have yielded the coarsest gold yet found in this locality. The vein is very thin, and consists of quartz with carbonate of iron, iron pyrites, and oxide of iron in greenish clay slate and argillaceous sandstone. The proportion of gossany quartz and iron ore found in this and neighboring reefs is considerable; the gold is found in both, in a finely divided state. The lodes are strong, and extend for long distances.

BOLLAND'S, URAIDLA.—Locality, section 128, hundred of Onkaparinga. The Government Geologist's report states that two tunnels have been driven E. into a hill rising some 150ft. above the gully flat, on the N.W. portion of the section, which have intersected several veins of quartz, ironstone, and pyrites, which traverse

the hill in a N. direction, outcropping here and there. The veinstone obtained from these tunnels has a favorable appearance for gold, but the samples taken were found, on assay, to contain no gold, and unless gold is found by surface prospecting there is nothing to warrant the continuance of operations; at the same time, as the section adjoining on the S., No. 41, has a gully which a few years ago yielded a considerable quantity of alluvial gold, and as this gully is crossed by numerous veins and reefs of quartz running N. into section 128 (from which veins the alluvial gold in the gully must have been derived), it is very advisable that both sections should be thoroughly prospected, as it is likely that auriferous veins and reefs may be found. The rock formation consists of argillaceous sandstone, sandstone, and clayslate. (Government Geologist, March, 1896.)

BOOMERANG.—Situated near the railway line, within 3 miles of Outalpa railway siding. Lode strikes N. and S., with an E. underlie of about 1 in 3; and can be traced for a considerable distance, in places being over 2ft. wide, in others narrowing down to a small seam or vein. The N. block is situated in low ground, the vein being overlaid with alluvial; on the strike of the vein, which is here erratic in its course, several small openings have been made, from 2ft. to 19ft. in depth, exposing vein matter, from 3in. to 6in. wide, of siliceous iron-stained material. The middle block is situated on a small ridge, rising slightly above the plain level; here the reef shows more distinctly, and for a distance of 140yds. has been prospected by a series of small shafts and openings, from 3ft. to 21ft. deep, the lode matter ranging from 4in. to 2ft. 6in. wide, portions showing bunches of galena, containing gold, silver, and lead. About the centre of the workings a small shaft has been sunk 21ft., the vein in the bottom being 16in. thick, a portion, then exposed on the hanging-wall, being exceedingly rich, the stone showing gold freely; the walls at this depth are fairly good, and will probably continue. The S. block has been prospected by open cuts and a number of small shafts, in various places, for about 200yds. in length, and from 2ft. to 25ft. in depth. The vein appears to strike diagonally to the line of the main lode, and averages about 3in. thick. For future prospecting and development, three underlie shafts should be sunk to water-level, at the most favorable points; also a system of surface cross-trenching adopted in various parts of the property, with the object of opening up other veins and formations, which, from surface indications, doubtless exist. Seventy-six tons 7cwts. treated at the Petersburg Cyanide Works returned 67ozs. 6dwts. 5grs. gold, valued at £220. 2s. 4d., the average yield being worth 57s. per ton. Two parcels, a little over 8 tons, treated by the Broken Hill Proprietary, gave satisfactory returns. Ten samples, from various points, extending through the three blocks, gave results from 1oz. 4dwts. to 2dwts. gold per ton. One sample returned 2dwts. gold, 39ozs. 6dwts. silver, and 53.1 per cent. lead. (I.M.R., 18-11-03.)

BOOMERANG NORTH.—Near Outalpa railway siding, adjoining and to the N. of the Cooee. At the time of the inspector's visit little work had been done, but the position of the ground is highly favorable, and will probably contain the same vein and lode formations as the Cooee property. A system of cross-trenching would at first be advisable, to locate the most favorable points for sinking shaft, &c. (I.M.R., 3-12-03.)

BOWKER'S CLAIMS.—Situated at Lovely Gully, Waukarings, adjoining the Broken Hill Syndicate claim. Worked in 1894, and it was reported that stone showing gold had been found, but little further was done.

BOOLOOROO.—In May, 1895, at Bunyerroo alluvial workings, a reef was found at a depth of 25ft. composed of ironstone and quartz, with a thick casing of conglomerate, consisting of gossan, ironstone, and quartz, in which gold was visible.

BOOYOOLIE, HUNDRED OF.—The Inspector of Mines, reporting in 1895, on two properties in this hundred, says, regarding the *Flinders Gold Mining Syndicate*, that the shaft should be sunk deeper, until it cuts through the reef, and then continued on the underlie 50ft. The lode should also be opened up at a point E. of the creek workings, where a small pit has been sunk. Regarding the *Roper Gold Mining*

Syndicate, the lode is 18in. wide, enclosed in decomposed gneissic rock. Samples from the bottom of the shaft gave an assay return of 4dwts. per ton. The drive should be continued to the S. until the footwall of the lode is met with. If the lode proved to be more valuable it should be driven on E. and W., keeping the footwall on the S. side of the respective drives. Failing to strike anything of value, he recommends that the outcrop be prospected along its strike by costeaning pits.

BRILLIANT.—Locality, near Macaw Creek, 3 miles S. from Rhynie. An ironstone formation outcrop, which was alleged to carry gold. A shaft was sunk to a depth of 50ft., and a sample assayed was stated to have returned 1oz. 10dwts. of gold and several ounces of silver per ton. It was also reported that at 40ft. a small body of kaolin, with chloride of silver, had been met with, that the ore carried exceedingly fine gold, and that there was a solid body of ore at the bottom of the shaft. The ironstone lode outcropping can be traced several miles. (1897.)

BROKEN HILL AND WAUKARINGA SYNDICATE, later known as White's Lovely Gully Claim.—Situated about 8 miles W. by N. of Waukaringa. In 1894 the Inspector of Mines reported that a shaft had been sunk 60ft. vertical and another 55ft. on the underlie. A lode exists about 3ft. 6in. wide, strike N.E., dip N.W. It is poor near the surface, but at a depth an ironstone vein with gold was struck, and yielded at the rate of 1dwt. 6grs. per dish. No further rich pockets were struck, and work was abandoned. Prospecting was restarted in 1906, and a Departmental report says that work was recently resumed by White (the original prospector) in a shaft which had been sunk by the original syndicate to a depth of 35ft. or 40ft., partly vertical and partly underlie, on an irregular lode or formation composed mainly of ironstone and ferruginous calcite. It strikes about N.E., through unsettled slate, and dips N.W. The width is considerable, but, so far, undetermined. At the bottom a drive has been made along it S., and a sample taken assayed under 1dwt. About 80ft. to the S. White has sunk a shaft which, at 35ft., has come on a gold-carrying vein, probably connected with the formation in the other shaft. It is very small on the E. side, but opens out to nearly 6in. where it has been followed down a little way to the N.W. A very rich pocket of gold specimens was found here. The vein is being driven on N. to connect the workings in the two shafts. A sample of fines obtained from the bottom part of the vein assayed 9dwts. per ton; a sample from the top part 1dwt.; and one from the E. end of the vein, which is composed of ferruginous claystone, gave 2dwts. per ton. These assays, and also the one from the body of the formation in the other shaft, are small, and appear disappointing, but it is evident that a good shoot of gold exists here, which should be followed up and proved at depth. (D.R. (Gee), 21-9-06.)

BUNYAROO SPRING.—This is near Leigh's Creek. Alluvial gold was discovered in a small gully. The circumstances of the find are not known, but a storekeeper at Leigh's Creek stated that he bought £200 worth of gold said to have been found here. (1889.)

BULLAPARATTA.—Situated about 18 miles from Yankalilla, on the old Bullaparatta Goldfield, where alluvial gold has been worked for at various times in the past with varying results. Recently attention has been directed to a large reef formation in the vicinity, from which it is supposed the alluvial gold was shed. The outcrop is very prominent, and traverses a rugged ridge, surrounded on three sides by steep gullies, 200ft. or more deep. The lode material consists mainly of quartz, ironstone, and gossan, and for about 300ft. to the point of the range has a very favorable appearance; but in the opposite direction the surface outcrop contains less iron, is not so friable, and is generally less likely looking. The workings consist of a tunnel, a shaft, and a number of trial pits and openings, extending for about 400ft. along the line of lode; the two former and some of the latter were done some years ago, by previous holders, and apparently did not disclose anything of value. The tunnel extends about 60ft., and at 10ft. from the entrance passed through lode material about 5ft. thick, composed of quartz, iron, and gossan; this is an offshoot or slip from the main ore body. Beyond this the ground passed

through is soft ferruginous sandstone, without any indications of lode material. On the opposite side of the principal formation a shaft has been sunk, about 50ft. deep, apparently on the footwall side of the lode. The surface openings are from 1ft. to 5ft. in depth, and disclose a large quantity of lode matter, in places over 30ft. wide, and in others the lode outcrops extend far beyond this width. At some period the outcrop must have stood high above the surface, and has now become weathered and broken, shedding lode matter for some distance on each side of the solid formation, the actual width of which cannot be determined until more work has been done. Out of 11 samples taken roughly in bulk from various points across the lode, three failed to disclose the presence of any gold, and the balance returned from a trace to 4dwts. of gold per ton. The inspector considers that, despite these poor returns, the property is worth development. Samples taken from a portion of the lode, about 4ft. thick in the centre of the formation, were dollied and washed in his presence, giving a return equal to 8dwts. to 10dwts. per ton, and here a prospecting shaft should be sunk. The 50ft. shaft should also be cleaned out, and a crosscut made, to determine how the lode carries down, and its value. (I.M.R., 11-12-03.)

BULLAPARATTA SLUICING COMPANY.—Returns were not satisfactory, and the company was wound up (1906).

BURNSIDE.—In November, 1894, the Inspector of Mines reported upon workings on sections 1051 and 1052, hundred of Adelaide. A tunnel had been driven 36ft. on the course of a lode at Slape's Gully; strike W. 20° S., with a 37° dip E.S.E. The lode, composed of ferruginous quartz enclosed by walls of claystone, was of an average width of 3ft. No trace of gold on assay. Another lode had been opened $\frac{1}{2}$ mile S., large and well defined, striking N. 15° W. Samples returned no gold, but the line of lode should be prospected. It was said that free gold had been found in the lode.

CAMERON'S REEF.—Locality, 8 miles N.W. by W. from Waukaringa. The Inspector of Mines reported upon this property in March, 1894, and stated that a lode exists, which, at a depth of 30ft., was 12in. wide, enclosed in calcareous slate. It appeared likely to be auriferous, but assays gave no trace of gold.

CALIFORNIA CLAIM.—On the Queen Bee (New Luxemburg) line of reef. A crushing of 10 tons is said to have averaged 9dwts. per ton.

COOEE.—Adjoining the Boomerang on the N.W., and is about due N. of their main workings, 3 miles from Outalpa railway siding. From the croppings on the surface the vein can be traced almost through the full length of the property, and for 150yds. in length has been opened out at various points by a number of trial pits and open cuts, from 2ft. to 10ft. deep. In most instances the openings have not penetrated the solid country, being still in alluvial and broken country rock, disclosing vein matter from 2in. to 6in. wide, underlying E. about 1 in 3. Towards the S. end an open cut, 10ft. deep, has exposed solid siliceous matter 6in. wide, with well-defined walls, regular underlie, and having the appearance of making larger. The other workings consist principally of a number of trial pits or openings, the siliceous vein in each instance being from 2in. to 4in. wide, all containing more or less gold. Four samples from the different openings assayed from 1dwt. to 3ozs. 14dwts. of gold per ton. A parcel of over 5 tons treated at Petersburg gave the result of 1oz. 2dwts. of gold per ton; this should encourage further development, by sinking shafts on the line of lode, and also prospecting, by surface cross trenches, to intersect any other lodes or veins that may exist. At present it is difficult to determine if this is the same formation as the Boomerang, or an offshoot that will junction with their main workings about the centre of their middle block. From the general strike it is likely to prove the former. (I.M.R., 19-11-03.)

CLARE, HUNDRED OF, SEC. 41.—The Government Geologist reported upon this property in May, 1893. The locality was a quarry in flaggy argillaceous slate and sandstone, the rocks dipping vertically and striking N. 10° to 15° W. Gold was obtained by washing the soil, decomposed rock, and other debris covering the

rock on the E. side of the quarry, where there are several small veins, from lin. to 3in. thick, which cut through the vertical strata at an angle of about 45° E., with a strike of N. 10° W. These veins are composed of siliceous brown iron ore and brown ore and gossan. The gold is not waterworn, but is crystallised in flat plates and octahedral and dendritic forms, showing that it has been derived directly from the veinstone, through the decomposition of the latter; hence the gold found upon washing the debris. It is not probable that this is the only auriferous locality in the district, as the bedrocks are similar to those in which gold is found elsewhere in this State. In many places they are traversed by quartz reefs trending N. and S., some of which may prove to be auriferous. On sections 138, 219, 214, 217, 523, 233, &c., there are quartz and ironstone reefs which are worth prospecting. Alluvial gold may exist in payable deposits in the alluvium of the numerous creeks and gullies of the district. For the purpose of testing the value of the discovery it was recommended that the veins should be followed down the underlie, to determine whether a larger vein or reef could be discovered, and that the surface soil and debris should be prospected to the N. and S. of the actual discovery.

CROW'S CLAIM.—Adjoining the Queen Bee Mine. Two shafts were sunk to a depth of about 100ft. in soft micaceous and hornblendic schist, containing thin veins of quartz showing gold; but no large reef has been struck.

CYGNET.—Situated on section No. 25, hundred Cassini, Kangaroo Island, and originally prospected by Tilka, a settler in the district. On December 13th, 1898, the Government Geologist reported that excavations were being made in a large lode outcrop of quartz and other siliceous material containing arsenical pyrites. At a depth of 45ft. the lode and formations, though ill-defined, are of considerable width. The outcrop is traceable for some distance. It strikes N.W. and dips 60° S.W. Of seven samples taken across the width of the lode, and at various points in it, only two returned a trace of gold. A washed sample of pyrites, however, gave—gold, 4dwts.; silver, 8dwts. One ton of this ore treated at the Mount Torrens Government battery yielded 5dwts. 3grs. of gold, valued at the rate of £3 14s. 6d. per ounce. The outcrop of this lode is strong and worth prospecting, as it is possible that payable shoots of gold may exist.

A Departmental report dated November 27th, 1906, states that operations were then being conducted by Mr. H. G. Taylor on behalf of the proprietary. A shaft has been timbered up in Tilka's old irregular workings, and the rest of the workings filled in. The shaft was then continued to a depth of 80ft. The lode dips to the S.W. at about 72° , and after passing a considerable distance down through the lode the bottom of the shaft is a little to the N.E. of it; a crosscut has been made from here across the solid lode, which was found to be 25ft. thick, and continued on in the soft formation on the other side of it. Ten samples taken along the lode in the crosscut assayed—No. 1, 1dwt. gold per ton; No. 2, 1dwt.; No. 3, 2½dwts.; No. 4, 1dwt.; No. 5, 2dwts.; No. 6, 1dwt.; No. 7, 8dwt.; No. 8, 5dwts.; No. 9, 3dwts.; No. 10, 1oz. 4dwts. The lode is strong and continuous, the strike being about W. 25° N. It has been opened up at three places to the W. by cross trenches, and is found to be from 4ft. to 6ft. wide near the surface. A sample from the opening farthest W. from the shaft—about 25 chains—assayed—gold, nil; from the next opening towards the shaft, gold, a trace; and from that nearest the shaft, gold, a trace (under 1dwt.). The lode has also been traced for a considerable distance E., and a large outcrop on the line of strike on sections 52, hundred Cassini, 3 miles W., is most probably the same lode. (D.R. (Gee), 27-11-06.)

The lode consists of siliceous and ferruginous matter, containing iron pyrites all through to a more or less extent. Twenty bulk samples, taken in 2ft. sections, 10 from each side of the crosscut, gave returns from traces up to 8dwts. per ton, or giving an average value for the full width of the lode (20ft.) of 2dwts. 6grs. of gold per ton. Seven samples taken from the ferruginous matter on the hanging-wall side of the lode, each section being 2ft. 6in. apart returned—four samples nil,

three trace, and one gave 1dwt. per ton. Sample also taken from the shaft where the lode was intersected gave trace of gold only, and two samples taken from the lode outcrop at each end of the shaft gave nil returns. From the above returns it will be seen that the gold contents of the material exposed are of very low value. The lode is large, well defined, and gives every indication of continuing in length and depth. Probably should the development work be continued shoots of better class material may be discovered that would warrant the erection of a reduction plant, but at present any large expenditure in that direction would be premature and unjustifiable. (I.M.R. (Jones), 23-9-07.)

DAY DAWN.—Locality, Waukaranga, adjoining West Alma. There is a lode running E. and W., 2ft. 6in. wide. One shaft has been put down 176ft. following the dip of the lode. The matrix of the ore is quartz intermixed with ironstone, and the country rock is sandstone. Samples taken from this lode in May, 1907, assayed 3dwts. 5grs.

DAW'S DIGGINGS.—Locality, the Eleanor River, about 28 miles W. from Kingscote, Kangaroo Island. Holes have been sunk along the river for a distance of $1\frac{1}{4}$ miles, both in the alluvial flats and on the rising ground. Gold occurs in the washdirt, associated with rutile and zircon. Some of the holes sunk appear to have opened upon an older drift deposit or Tertiary lead. The prospect of meeting with payable alluvial gold by following up the veins of gold met with are sufficiently good to induce experienced diggers to more thoroughly test the locality. Colors of gold are obtainable in the banks of the Eleanor River about 1 mile below this place, where the river flats are narrower.

Metallic minerals may be expected to be met with in much of the metamorphic sandstone, slate, and granitic country from Backstairs Passage to Cape Bórda, and in payable quantities in some portion of the areas occupied by these rocks. They are a continuation of the rocks of the mainland, which in many instances have proved to be metalliferous. Gold exists in veinstone at the old Kohinoor Mine, Tilkas, Debney's, &c., and in alluvial deposits on the Eleanor River. Hitherto the prospecting for gold has been carried out in an unskilled manner, and it is very probable a more energetic and systematic search will result in the discovery of payable deposits. The Point Morrison district seems to me to present specially favorable features for gold prospecting, and an examination of the alluvial deposits of the Cygnet, Eleanor, Harriet, Stunsail Boom, and other rivers is most desirable. (Government Geologist, 13-12-98).

DORG'S GOLD LEASES, 543 AND 563.—Situated on the Angepena field. The Government Geologist, in April, 1896, reported that he found here an irregular mass or "blow," in which were veins of kaolin and pockets of ferruginous clay and gossan. Country rock chiefly crystalline limestone. Assays of average samples gave no trace of gold.

DEBNEY'S.—Locality, section 96, hundred of Haines, Kangaroo Island. Here there is a large quartz outcrop containing arsenical pyrites, which has been prospected to a small extent only. The strike of the lode is N.E. and the dip about 45° S.E. The veinstone has a highly favorable appearance for gold, and is worthy of being more systematically prospected. Of four samples assayed two returned a trace of gold. Further prospecting is recommended. (Government Geologist, 13-12-98.)

DUSTHOLES REEF.—This is a large reef or lode formation situated about 2 miles N.W. from the Mount Grainger Mine; it strikes about N.E.; the outcrops are large and well defined, and can be traced on the surface for over a mile. Practically no sinking has been done upon it, and up to June 30th, 1907, the total quantity of ore treated at the Petersburg Cyanide Works was 138 tons 13cwts., which returned 55ozs. 7dwts. 19grs. of gold, valued at £199 5s. 8d., the average yield being worth 28s. per ton.

ECHUNGA GOLDFIELD.—Situated in the hundred of Kuitpo, which see for details of the workings, page 227. This field was discovered in the early part of the year 1852. The following description is abridged from an interesting account of the discovery contributed to the *Mount Barker Courier* by Mr. W. Chapman, who claims to be the first discoverer:—The first sign of gold was got on what was known as "the Company's land," about 18 miles S.E. from Adelaide, not far from the old Wheatsheaf Inn. Mr. Chapman made known his discovery to his father and to Messrs. Hampton and Hardiman, men who were well acquainted with the country, and a thorough search was begun. Very rich surface gold was found by the party on land not far from the place where the first prospect had been washed. It was on the side of a hill above what is now known as Donkey Gully. The gold was traced from there to Chapman's Hill. At this place gold was found at the foot of a tree, laid bare by the dripping of water from the branches. Half an ounce was picked up by dry fossicking; and on the following day Hampton washed several ounces of gold from the roots of this tree. Before reporting the discovery the men carted away two or three drayloads of dirt in bags, and stacked it on Hampton's land. Subsequently, on being washed, it yielded an ounce to the bag. By this time the people in the neighborhood had begun to suspect that the Chapmans, Hampton, and Hardiman were getting gold, but it was determined that the secret should be kept until a claim had been made upon the Government for the £1,000 offered as a reward for the discovery of a payable goldfield. This offer was published in the *Government Gazette* of December 18th, 1851. Mr. Chapman, sen., and Mr. Hampton went to town for this purpose on August 23rd, 1852, taking with them about 7ozs. of rough gold. At the Treasury they made oath that the gold had been found in the province of South Australia. On the day following a party of from 50 to 60 horsemen, headed by Mr. B. T. Finnis (Colonial Secretary), Mr. Chapman, Mr. Hampton, and a number of police troopers visited the place. Mr. W. Chapman was told to wash out some dirt in the presence of Mr. Finnis, and in order to render fraud more difficult of accomplishment he was made to take off his coat and roll up his shirtsleeves. Mr. Chapman gathered up a dish of stuff from a part of the surface not previously touched, and began to wash it. He was closely hemmed in by an eager and excited crowd. Slowly the dirt was panned off, but no sign of gold was to be seen. The crowd became angry and impatient; they swore that the whole affair was a swindle, and expressed a strong desire to "lynch" and "string up" the prospector. But he was confident of success and of protection from the police. With a quick twirl of the dish the last of the dirt was shot out and the gleam of gold could be seen at the bottom of the pan. Thereupon a scene of great excitement ensued, and the shouting and noise was so great that horses tied to trees hard by broke their bridles and galloped away. The desire to wash for gold seized upon the people—saucepan lids, pannicans, kettles, cans, and even hats were made use of, and a little gold was found by all. Mr. Chapman washed out other dishes of dirt in the presence of Mr. Finnis, and from one of them nearly a quarter of an ounce of gold was got. Mr. Finnis returned to town carrying with him about half an ounce, and proclaimed the field to be a genuine discovery. The conditions of the reward were that licences (at that time 30s. each) to the value of £1,000 should be taken out during the first two months, and that £10,000 worth of gold must also be found within the same period of time. In two months 684 licences were taken out, being equal to £1,026 sterling. The Messrs. Chapman, Hardiman, and Hampton applied for the reward after an interval of three months, but were not successful. There was no proof that £10,000 worth of gold had been obtained, except the statements made by diggers and storekeepers; these represented that £18,000 worth had been got. The matter was brought before the Council, and a sum of £500 was given to the prospectors, leaving the question of reward still open. About 1871 two sums of £200 and £300 were paid for the discovery of gold at Jupiter Creek. Mr. W. Barker, a storekeeper on that field, bought gold to the extent of £3,000. It is impossible to state the amount of gold obtained on the field since its opening.

In a return dated July 31st 1871, by the then Warden of Goldfields (the late W. J. Peterswald), and published in the *Government Gazette* of August 10th, 1871, the following estimates of the value of the gold found to date are given:—

Old Diggings, Echunga	£300,000
Jupiter Creek	60,000
Barossa	180,000
Mount Pleasant	8,000
Hamlin's Gully	2,000

EAST ALMA.—Situated at Waukaranga, adjoining the Alma and Victoria Mine on the E. There are two lodes, having a strike E. and W., and 2ft. 6in. wide. Two shafts have been put down, respectively 190ft. and 109ft., following the dip of the lode, and from the former there is a drive 148ft. long, and from the latter 20ft. The lode formation contains quartz intermixed with ironstone, and the country rock is sandstone. The company spent in the work of development to the year 1890 the sum of £3,151 2s. 8d. Samples taken by Messrs. Gee and Grundy from these lodes in May, 1907, assayed from 3dwts. 12grs. to 1dwt. 23grs.

ECLIPSE MINE.—Locality, section 80, Onkaparinga, near Forest Range. The reef strikes N. and dips to the E., and the bedrock, consisting of greenish claystone and sandstone, strikes N. and S., and dips 45° E. Gold was found in 1875, and carbonate of bismuth showing gold. This was said to have yielded at the rate of 14ozs. to the ton. A small company was formed, and the reef was worked for a short time; but the results obtained were not good, and the company dissolved. The section became the property of Mr. Love, when work was resumed for a period. The country in the neighborhood is favorable for alluvial gold in the gullies and surfacings.

ECLIPSE MINE EAST.—Situated on section 65, Onkaparinga. A shaft was sunk (1883) in the hope of cutting the Eclipse reef at a depth of 100ft. No records.

FEDERAL.—Situated 2½ miles N.W. of Woodside; section 5186, hundred Onkaparinga. For about 100yds. in length several small openings from 2ft. to 4ft. deep and one shaft, sunk on the point of the hill to a depth of 27ft., have disclosed a lode formation about 4ft. wide, consisting of friable sandstone carrying irregular veins of siliceous ironstone, which in places run with the formation, and in others strike diagonally across it. Portions of the friable material in proximity to the vein also contain more or less fine gold. The formation strikes N. and S., has a W. underlie, and dips rapidly to the S. Twenty-two tons of stone, treated at the Mount Torrens Cyanide Works, gave an average yield of 10dwts., which is very encouraging; and will justify a better system of development, by driving from the foot of the S. portion of the hill along the course of the lode, by means of which a thorough exploration above water-level would be made, and as the hill rises rapidly, 70ft. or 80ft. of backs would be obtained in a comparatively short distance. Samples taken returned as follows:—N. opening, 4ft. deep, 3dwts. per ton; second opening, 2ft. deep, trace; coarse or selected stone from the shaft, 1oz. 4dwts.; bulk fines from shaft, 1dwt.; pyrites from shaft, trace; opening 60ft. S. of shaft, 14dwts. per ton. (I.M.R., 20-4-04.)

A further report in January, 1907, states that the work up to that date consisted of three shafts, sunk to depths of 27ft., 40ft., and 35ft. respectively, and one tunnel driven at the S. end of the hill. The shafts have disclosed lode formation, about 4ft. wide, composed of friable gritty sandstone containing irregular veins and bunches of siliceous ironstone underlying W. and dipping rapidly in a S. direction, all carrying more or less gold, some portions being of exceedingly good value. The tunnel has been driven about 129ft., passing through several ferruginous veins and lode matter fully 4ft. wide, all containing a little gold. From present appearances it is difficult to determine whether this is the main formation or not, and to settle this the tunnel should be extended another 30ft. or 40ft., which could be done at small cost, as the material is of a soft and friable nature. With the exception of one small opening, all the work has been done towards the S. portion of the hill, and

now it is recommended that at a shallow opening on the outcrop near the N. boundary an inclined shaft should be sunk on the lode formation to a depth of 100ft., or as much deeper, as water will permit. The opening referred to has disclosed well-defined ferruginous vein matter 4ft. wide, from which a sample taken at the previous inspection gave 3dwts. per ton. This is not payable, but the vein at this point has a very favorable appearance, and in depth the gold contents may probably improve. (I.M.R., 3-1-07.)

The total ore treated at the Mount Torrens Cyanide Works is 31 tons 6cwts., which returned 15ozs. 11dwts. 14grs. of gold, valued at £61 18s. 2d.; the average yield being worth 39s. per ton.

EDGARDO.—Locality, near Taltabooka (N.E.), and adjoining the Triumph. The Inspector of Mines reported, in 1895, a shaft down to 90ft. The lode averaged 2ft. 6in. in width. Samples taken from a heap on the surface gave a return of 1dwt. of gold and 2ozs. 2dwts. silver per ton.

ESMONDE.—Situated 2 miles S.E. from Taltabooka. Two parallel E. and W. lodes, dipping S., traverse the property. A shaft on the S. lode was reported by the Inspector of Mines (1895) to be 125ft. deep, and at that point there are two drives, E. and W. The lode from top to bottom averaged about 14in., and consisted of ferruginous quartz intermingled with small quantities of carbonate and sulphide of lead, enclosed in indurated and soft micaceous schists. Samples taken assayed 1oz. 12dwts. gold and 1oz. 3dwts. of silver per ton. The N. lode has an average width of 10in., and is of a similar character; samples assayed 1oz. of gold and 2ozs. 6dwts. of silver per ton. A parcel of 6 tons sent to Freiberg returned gold to the value of £43 9s. 5d., and a parcel of 5 tons 12cwts. treated at the Mount Torrens Cyanide Works yielded 15ozs. 2dwts. 8grs. of gold, valued at £59 16s. 11d. At a later date small parcels were sent to the Petersburg Cyanide Works for treatment, and 24 tons 18cwts. yielded 18ozs. 19dwts. 3grs. of gold, valued at £66 13s. 2d.; the average extraction of the above parcels being worth 93s. per ton.

FAUGH-A-BALLAGE.—Adjoins the Esmonde, and was first opened in 1893 by Carroll and party. The Inspector of Mines reported in 1895 that the lode appeared to be a continuation of the Esmonde N. lode; 18in. wide at the top, and increasing to 2ft. 6in.; same constituents in lode and similar country rock. The stone is richer as depth is reached. Samples taken from ore at grass assayed 1oz. 13dwts. of gold and 3ozs. 12dwts. of silver per ton.

FERGUSON'S.—Locality, N.E. from Moolooloo Head Station. A trial of 15cwts. of stone was stated to have yielded at the rate of 10dwts. per ton. (1899.)

FOREST RANGE DIGGINGS, hundred of Onkaparinga, near the Eclipse Mine.—In 1854 gold was found in Stony Creek. Prospectors Biggs, Mason, and Norton got 20ozs. gold from two loads of washdirt. The country rocks consist of greenish micaceous clayalate and kaolinised slates; there are also large quartz reefs with ferruginous cappings. The Inspector of Mines says of this property:—An enormous quantity of prospecting has been done at shallow depths, and shafts sunk in clusters, apparently without any definite object. One tunnel has been driven 234ft., and its greatest depth is not more than 40ft. from the surface. The ground has been proved only in one place to a depth of 145ft. If the reefs were proved to a depth of 500ft. it is probable that satisfactory returns would be obtained. In one place carbonate of bismuth was found, but the discovery was not pursued. For the 1890 edition Mr. Vinrace Lawrance, at request, supplied the following information:—Our company is mining for gold and bismuth, and holds 238 acres of freehold. No true fissure lode has yet been discovered, but innumerable veins, quartz deposits, and dykes exist. The general strike is N. 4° to 6° W., with a dip 38° to 60° E., the reefs varying from 12ft. width to mere streaks. Eight shafts have been sunk, of depths ranging from 40ft. to 106ft., of which only three follow the dip of reefs. The nine drives aggregate 1,382ft. The reefs consist of concretionary ironstone, quartzite, and quartzose sandstone. The country rock is said to be lithologically identical with that of the central and western goldfields of Victoria. The ore

consists of iron and arsenical pyrites, and so far no payable reef has been opened. A crushing of 25 tons gave only 2dwts. to 3dwts. of gold to the ton. It is, however, estimated that from £15,000 to £20,000 worth of alluvial gold was obtained here by prospectors and diggers in former times. (1890.) It was reported in 1896 by Mr. A. Baum that a nugget of gold weighing over 10ozs. had been found on section 65, close to where rich gold was found several years previously, and where a nugget weighing 48ozs. was met with.

FOX'S PROPERTY (Marybank).—Section 829, hundred of Adelaide. The Inspector of Mines reported in June, 1890, that there were strong indications of two lodes outcropping as ferruginous quartz, striking S.S.W. and N.N.E., and looking favorable for gold; but assays did not give any return. Nothing had been done to test the reefs. The Rev. Tenison Woods held the opinion that gold would be found in them.

GAWLER RIVER.—The upper branches of the river, known respectively as the North and South Para, are auriferous, gold having been found along their courses. Very little prospecting has been done, owing to the greater part of the ground being private property.

GLEN TAGGART.—This property is situated at Clarendon, and existed as a gold-field a little over 12 months, after being opened under the Mining on Private Property Act. It was reported that a quantity of gold was secured, but it was not regarded as a rich field.

GOLDEN GATE.—Situated on the S.E. portion of section 810, hundred Moorooroo, private property, about five miles from Angaston. In December, 1904, the Inspector of Mines reports that this is a comparatively new discovery, located on a small rise about 1 chain from section 454. The vein material is generally overlain with alluvial in the portion worked. A vein of ferruginous matter about 2ft. wide shows on the surface, and on this a shaft has been sunk 27ft., disclosing a body of kaolinised material with small gritty ferruginous quartz seams running in various directions with no particular strike or bearing, and having every appearance of being a strong kaolinised dyke striking about N.W. and S.E. The workings so far do not disclose any defined lode or walls, and doubtless the gold is contained principally in the gritty quartz seams, some prospects of which gave very good results. A number of samples taken from various places returned on assay from a trace to 8ozs. 13dwts. per ton. At the bottom of the shaft a small crosscut has been driven about 12ft., still showing the same decomposed matter, with no appearance of walls. A similar crosscut should also be driven on the opposite side, as from surface indications there is evidently vein material in that direction. A trial crushing of 6½ tons treated at Mount Torrens Government Cyanide Works gave a little over 38ozs. of gold, or nearly 6ozs. per ton. From the dip of the veins it would be advisable to sink a shaft some distance S.E. of the present workings, and at the depth of 50ft. or 60ft. crosscut on each side to prove the width and value of the formation, which at present has a very favorable appearance, but until further developed its actual value cannot be ascertained. (I.M.R., 1-12-04.)

Up to February, 1906, 135 tons 14cwts. forwarded to the Mount Torrens Cyanide Works for treatment returned 269ozs. 19dwts. 5grs. of gold, valued at £1,130 0s. 4d., a yield per ton of 1oz. 19dwts. 18grs.; the average value being worth 166s. per ton. At the latter end of 1906 a 10-head battery was erected by the company at the mine, and 440 tons treated returned 73ozs. 15dwts. of gold, being a yield per ton of 3dwts. 9grs. The company went into liquidation, the machinery being purchased by the owner of the freehold. (1907.)

GOLDEN PILE.—Locality, section 5172, Onkaparinga. The Government Geologist reported in 1898 that the workings on this property consisted of an inclined shaft 58ft. deep, with drives at 25ft. and 54ft. The auriferous vein, which is a few inches wide, fills a fissure conforming to the bedding of the blue clayslate which forms the country rock. The vein contains, with argillaceous material, quartz and ironstone, and carries fine gold, which also exists in the soft decomposed rock which accompanies the lode. A parcel of 10 tons 16cwts. treated by cyanide

yielded 11ozs. 16dwts. 14grs. of gold. Samples taken yielded various results up to 12dwts. per ton. The prospects justify exploration at greater depths.—*Vide* "Golden Hill."

GOLDEN JUNCTION.—Situated about $\frac{1}{2}$ a mile N. of the Mount Grainger Mine. In lease 631 an inclined shaft has been sunk to the depth of 80ft., exposing a ferruginous formation, averaging 3ft. wide, with a W. underlie of 2 in 6. At the bottom it appears more promising than at the surface, as it contains more ironstone, which seems to be the principal gold-bearing matrix. The hanging-wall shows fairly good; the footwall is broken and disturbed, and the question as to whether it is the true footwall or not can only be determined by crosscuts. Throughout the property there are small prospecting shafts and openings, for fully 100yds. in width and about 12 chains in length, in almost every case exposing crushing material containing more or less gold. For future exploration and working a main shaft should be sunk far enough to the W. of the present underlie shaft not to intersect the lode at a less depth than 200ft.; then crosscuts should be opened out at the 100ft. and 200ft. levels. The other openings on the parallel veins should be further prospected by underlie shafts, to test their persistence and value prior to sinking vertically. Two samples from the shaft assayed 7dwts. and 1oz. 1dwt. respectively. (I.M.R., 19-2-00.)

In November, 1902, the inspector reports that the principal work of development since the previous visit has been the sinking of a main shaft, and crosscuts at various points, to connect with the original workings, from the old underlie shaft. From the upper levels a good deal of work was done, and several parcels of good ore raised by the original syndicate; the mine was then taken over by an Adelaide syndicate. The main shaft, which is 12ft. by 4ft. 6in., has been sunk to a depth of 170ft., well timbered to about 150ft., centred, and good ladder road fixed; also crosscuts driven and connected with the old workings. At the bottom two drives were made on the course of the lode 30ft. and 35ft. respectively, each exposing the same class of material, viz., slate with small ironstone veins, of too low value in bulk to be payable. The Adelaide syndicate having discontinued operations, the property was taken over by the present proprietors, who are sinking a winze on the course of the lode, from 170ft., now down 20ft., disclosing lode matter about 5ft. wide, composed principally of clayslate, containing a small proportion of seams and nodules of iron. Two samples from the coarse-sorted stone gave 3dwts. and 1dwt. per ton respectively, and two from the fines gave 9dwts. and 5dwts. per ton. To further prospect this property, the winze should be continued, and by it the lode can be explored to water-level at a small cost, and the quantity and quality of the lode matter tested, with a view of ascertaining whether the further sinking of the main shaft would be justified. The underlie of the lode has, apparently, changed from its original course, the inclination being more under the upper workings. (I.M.R., 26-11-02.)

One hundred and thirty-seven tons nine hundredweight treated at the Petersburg Cyanide Works returned 60ozs. 7dwts. 8grs. of gold, valued at £231 5s. 2d., the average yield being worth 33s. per ton.

GOLDEN HILL (also known as "Duchess of Neidorf").—Situated about $\frac{1}{2}$ a mile from Lobethal. An underlie shaft has been sunk to the depth of 112ft., water-level, on a ferruginous slate formation, the full width of the shaft, the hanging-wall being fairly well defined, striking a little to the W. of N., and underlying 3 in 6 to the E. At the 30ft. and 60ft. levels, drives have been made for some distance N. and S., the ore vein being in shoots and bunches of iron-stained siliceous material against the hanging-wall, and having a N. dip. From these workings 12 tons of stone, returning 1oz. 2dwts. of gold per ton, have been taken; the quality of stone in each drive is now of low value, but if they were continued, possibly other shoots of better-class ore might be struck. There is a decided improvement in the stone for the last 2ft. at the bottom of the shaft, the vein being 10in. wide, and associated with iron of the most favorable character; but the gold contents are small. About

150yds. in a N. direction an open cut has disclosed a lode formation, but little work has been done to test it. The shaft should be sunk 30ft. or 40ft. deeper; and future operations guided by results. (I.M.R., 4-8-00.)

Forty-four tons one hundredweight treated at the Mount Torrens Battery and Cyanide Works returned 40ozs. 7dwts. 16grs., valued at £149 12s. 8d., the yield being worth 64s. per ton. A parcel of 11 tons included in the above figures was a trial from the mullock dump, which returned 1dwt. 20grs. per ton.

GOLDEN NOB.—Worked by a Port Victor syndicate. Situated near Blackfellow's Creek, close to the Finnis River. At various times in the past a considerable quantity of alluvial gold has been obtained from workings in the lower portion of the ground; above these the hill rises to a considerable height, and shows a number of lode outcrops, striking N. and S., which have doubtless shed the alluvial gold. To test these a tunnel is being driven E., which, at the time of the inspector's visit, was in 209ft. The rock passed through is chiefly slate and sandstone, but in the face a very favorable change is taking place, the rock being more decomposed, and showing bunches of iron and kaolinised matter, indicating the near approach to lode material. As a prospecting venture, the tunnel should be continued. (I.M.R., 17-12-03.)

GOLDEN ROCK.—Situated 13 miles from Willunga, and about $\frac{1}{2}$ a mile N. of the Little Gem, Blackfellow's Creek. The workings comprise several surface openings, a shaft, and a tunnel. The latter, with the approach, has been driven on the course of the vein formation for 130ft., and connected with the shaft at the depth of 35ft. The lode formation is about 2ft. 6in. wide, and consists of ferruginous slate, with small seams of quartz, from 1in. to 3in. wide, the larger ones being near the centre of the formation and the smaller on the footwall. The shaft has been sunk 75ft., the upper portion being securely timbered, and at 35ft. connected with the tunnel. The vein matter in the shaft bottom is similar to that in the tunnel, with clean unbroken walls and regular underlie. For a distance of about 300ft. N. of the shaft several trial pits, from 2ft. to 20ft. deep, have been sunk, in each instance disclosing the same formation, with rather larger veins of quartz, and will probably be intersected by a drive N. from the shaft. To the E. of the main formation there is a diagonal vein, from 15in. to 18in. wide, which will probably junction on the surface, about 100ft. N. of the shaft; but taking the two underlies into consideration, it should come much nearer as the shaft is being sunk. Nine samples from various parts of the workings gave on assay very poor returns, the best only showing a trace of gold. All the work has been well done. (I.M.R., 11-12-03.)

GOLDEN THORPE (CARN BREA).—Situated about $\frac{1}{4}$ of a mile S. of the Federal, $2\frac{1}{2}$ miles N.W. from Woodside. Two shafts have been sunk to depths of 24ft. and 50ft. and connected by a drive. The lode formation is 5ft. wide, and is composed of decomposed sandstone and gritty kaolinised material, with veins of ferruginous quartz, the largest, on the footwall, being 4in. thick. The walls are fairly well defined, and the vein matter is likely to be persistent in depth, and to test this the shaft should be continued. (I.M.R., 20-4-04.)

Up to June 30th, 1907, 143 tons 18cwts. treated at the Mount Torrens Cyanide Works returned 68ozs. 17dwts. 14grs. valued at £272 14s. 6d., the average yield being worth 34s. per ton.

GRUNDY GOLD MINE.—Situated on private property, at Second Valley, near Cape Jervis. Reporting in December, 1901, the inspector states that prospecting to a small extent has been carried on with encouraging results. A strong lode formation, which appears about 12ft. wide, has been disclosed by a shaft 30ft. deep; it strikes N.E., and has a rapid underlie to the S.E. A bulk sample of 11 tons 15cwts., tested at the Mount Torrens Government Cyanide Works, yielded 8dwts. per ton, which is regarded as very satisfactory. About 300ft. from the shaft a parallel formation exists, but, so far, little work has been done on it. The prospects are encouraging, but the inspector recommends careful prospecting at depth prior to erection of machinery. (I.M.R., 2-12-01.)

Further report, May, 1902. A company has been formed to work the property; the shaft has been deepened a little, and a drive made N., on the hanging-wall side. A large body of gold-carrying ferruginous quartz was exposed; prospects tried yielded at from the rate of 1dwt. to 1oz. per ton. The free gold in the stone is of a shotty character, and contains very little silver. Bismuth shows freely in places, and high assays have been obtained for both bismuth and gold. Testing at deeper levels is fully warranted. (I.M.R., 27-5-02.)

A third report, in October, 1902, shows that work of development has been vigorously carried out. No. 1 shaft is sunk to a depth of 51ft., the lode at this depth being about 10ft. wide, composed of highly ferruginous quartz, portions passed through being payable. At 90ft. on the lode underlie, drives N. and S., 15ft. and 26ft., and a rise of 14ft., disclose the same class of material. From the hillside a tunnel has been driven 240ft., intersecting the lode at 260ft., on the underlie, where it proves fully 6ft. wide, and of the same favorable character. Drives N. and S. are in progress on the course of the lode; the S. drive, at 18ft. from the tunnel, contains a splendid ore body, fully 6ft. wide, and showing gold freely in the face. N. drive, 33ft., lode being of similar value and character for greater portion of the distance; disturbed at the face by an intrusive bar of quartzite, which will probably disappear as the drive continues. From the tunnel a winze was sunk 14ft. in good stone. Further W., and some considerable distance towards the hilltop, a shaft has been sunk, about 20ft. deep, on No. 3 lode, which is of similar character to No. 1, and carries a little gold. For future work a rise from the tunnel-level should connect with No. 1 shaft, and in the N. portion of the mine a prospecting shaft should be sunk, from 200ft. to 300ft. N. of the present workings. The prospects of the mine seem good, and it is particularly well situated for working. (I.M.R., 24-10-02.)

A 10-head battery was erected at the mine in 1903. Two parcels of stone were treated, one of 128 tons gave 4½dwts. per ton, and the other of 450 tons, 2½dwts. per ton.

Operations were then discontinued and the company went into liquidation.

GRÜNTAL MINE is situated about a mile N. from the township of Grunthal. There are two shafts, both nearly full of water. On the surface there are several buildings, including an engine-house. The veinstone raised consisted of quartz, calcspar, and gossan, with iron and copper pyrites. The country rocks are clay-slates and argillaceous sandstones, dipping E. The locality is a likely one for gold. No information received concerning the past working of this mine. (1887).

GOLDEN POINT.—Locality, 15 miles E. from Terowie (hundred of Wonna). Veins, composed of quartz and gossan, with pyrites and iron oxide, occur between layers of clay-slate and jointed sandstone, proved in a shaft to a depth of 50ft. It was stated that from Ample's claim 2½ tons of stone yielded 5½oz. of gold under treatment at Woodside. The rocks are similar to and are a continuation of the Uooloo rocks, and the country generally has an auriferous appearance. Mr. Adamson, jun., forwarded these crushings:—At Teetulpa battery 2 tons gave 1oz. per ton; Eureka battery, 2 tons gave 14dwts. per ton; and at Ballarat School of Mines, 10 tons gave 10dwts. per ton. The Inspector of Mines reported on this property in 1889. He saw veins of auriferous quartz and gossan from 3in. to 8in. thick. The gold found was fine, and assays ranged from 5dwts. up to 1oz. 1dwt. per ton.

HARROLD'S CLAIM.—Locality, section 16, Arkaba. The report of the Government Geologist in 1896 was to the effect that the workings were on a quartz reef traversing clay-slate and sandstone, consisting of veined quartz with gossan and iron, and having a favorable appearance for gold, but not showing any. Assays gave no return. More prospecting advisable.

HEATHER BELL.—N. of and adjoining the Mount Grainger Mine. The lode outcrop, which is a continuation of the Mount Grainger lode, has been traced through the property by a number of cross trenches and trial openings, which in every instance

show more or less gold. A vertical shaft was in progress, being at the time of the inspector's visit 112ft. from the surface, and will probably intersect the lode at 150ft. (I.M.R., 12-2-00.)

HORSESHOE.—Situated 3 miles W. from Lovely Gully, in the Waukaringa district. The Inspector of Mines reported that there are five distinct lodes going through the property. A shaft had been sunk 40ft. on a strong well-defined lode, composed of quartz, gossan, and ironstone; strike N. 35° E., with a dip E. 35° S. 4ft. wide at the bottom of the shaft, and enclosed by walls of indurated claystone. The assay of samples gave nil returns. No. 4 shaft, 60ft. deep; strike of lode E. 30° N., and dip S.E. A drive at the bottom of the shaft exhibits a strong lode carrying copper, as do most of the other lodes in small quantities, but no trace of gold. Surface prospecting recommended.

HYLAND'S GREAT GUN.—Situated on section 418, Monarto, and was examined by the Government Geologist in 1897. Principal workings, two shafts 30ft. apart, between 50ft. and 60ft. deep, on a large reef outcrop consisting of quartz, ironstone, and argillaceous material, striking E. and W. through kaolinised slate and metamorphic sandstone and slates. Width of lode, 3ft. to 6ft. near the surface, but not proved at the bottom of the shaft. Other veins of quartz and ironstone exist in the vicinity, and the veinstone has a favorable appearance for gold. The reef extends only 30ft. or 40ft. along its course; operations had not got beyond the prospecting stage. A little fine gold is visible in some of the quartz and ironstone veins. Samples tested showed the existence of gold, but not in payable quantities, there being only a few pennyweights to the ton.

INGLEWOOD.—Gold was found at Inglewood, 15½ miles N.E. from Adelaide. The only information obtainable is that during June, 1870, the English, Scottish, and Australian Chartered Bank bought 7ozs. 15dwts. of gold obtained here.

JOHNSON'S GULLY.—Ten miles N. of Waukaringa. Found in 1894. An ounce of coarse gold was obtained from six buckets of washdirt, and nuggets from a few grains to 3dwts. were secured. Twenty diggers were at work. In March, 1895, the Inspector of Mines found 44 men there, one of whom stated he was getting 1oz. per diem, whilst others were barely making a living. The gully was soon worked out.

IRONCLAD.—Situated ½ a mile N.E. of Mount Grainger, on a large range, rising to a considerable elevation above the plain. The workings are confined to two shafts and several small openings, sunk on various promising formations. No. 1 opening is about in the centre of the property, and discloses a lode formation of ferruginous quartz, from 2ft. to 3ft. wide. A little to the N. of this a shaft was being sunk, the depth then being 15ft., in soft veinstone, 3ft. wide, which will probably become harder as sinking is continued. About 5 chains further N. there is a strong iron-stained formation, striking E. and W., and on the N. side a vertical shaft is in progress, present depth 50ft. It was intended to continue this to the 100ft. level, and then crosscut through the formation, to ascertain its width and value. On the N. side of the formation, and 3 chains in a W. direction, a surface opening exposes quartz croppings for fully 7ft. in width. A crosscut from the main shaft should also prove the value of this. The general prospects are favorable, and further explorations are warranted. In a further report, dated August 28th, 1900, the inspector states that No. 2, or the south, shaft is down 90ft., and from the bottom, it was stated, 60ft. of crosscutting has been done, showing two formations, 9ft. and 6ft. thick respectively, which, as shown by the ore dumps and material at the surface, consist of claystone and ferruginous matter, assaying from 2dwts. to 5dwts. per ton; much higher assays have at times been obtained, but the results have been very irregular. No. 1 shaft, further N., towards the hilltop, is 100ft. from the surface, and a crosscut made 90ft.; at 12ft. from the shaft a formation is passed through, 9ft. from wall to wall, and containing two veins of siliceous ironstone, each about 2ft. wide; at this point occasional samples worth from 5dwts. to 6dwts. per ton have been obtained, and the remainder of

the crosscut is in country rock, with occasional seams and bunches of ironstone, carrying, in some instances, fine colors of gold. It is proposed to extend this crosscut some short distance further, with the object of intersecting a formation showing on the surface, in which gold was obtained in a shallow trench. The most promising formation at present exposed is situated about 160ft. west of the main shaft; it is about 3ft. wide, strikes E. of N., consists of ferruginous quartz, containing pyrites, and has assayed for gold up to 3dwts. per ton. This formation could be tested in two ways: one by sinking on the present opening, as an underlie shaft, for a further depth of 50ft., and then drive along the course; the other, to drive in a N. direction from the same opening, in the lode continuation, which, at a distance of 150ft., would probably give about 60ft. of backs. For preliminary prospecting the latter would be the less expensive plan, and would probably answer the purpose, as should shoots of better gold-bearing stone exist at the deeper levels, doubtless they will be encountered in the tunnel, after which deeper explorations could be made. (I.M.R., 28-8-00.)

In an additional report, dated February 22nd, 1901, Inspector Matthews says that the present working shaft has been sunk to a depth of 86ft. The lode formation is about 3ft. wide; it underlies to the N. very rapidly, and consists of a network of small seams of ironstone, all carrying more or less gold. The tunnel, which has been started apparently on a separate formation, has been extended about 45ft.; two small crosscuts have been made in opposite directions, each disclosing a considerable body of lode material, consisting chiefly of slate and siliceous ironstone veins, from a few inches to 3ft. wide, of a very promising character, and containing fine gold. This should be further prospected to ascertain its true course and value. (I.M.R., 22-2-01.)

Eight tons treated at the Petersburg Cyanide Works returned 11ozs. 6dwts. 14grs. of gold, valued at £42 8s. 4d., the average yield being worth 106s. per ton.

JUANITA.—Situated about a mile N.N.W. from Taltabooka Well. A shaft 17ft. deep was examined by the Inspector of Mines in 1892, in which was an ironstone vein 5in. wide, from which he took samples. Assays returned no trace of gold or silver, and his opinion was that the venture was valueless.

KING'S BLUFF.—Situated 3 miles W.N.W. from Olary Railway Station. A discovery of gold was made at this place on the 4th March, 1887, a prospector getting 8grs. of gold to the dish of dirt by washing, at the foot of King's Bluff, in a dry creek running into a gully a $\frac{1}{4}$ of a mile wide and about 2 miles in length. A rush of from 300 to 500 men took place, but, though the prospectors are said to have obtained an ounce of gold for their first week's work, the results as a whole were not encouraging. In common with the Teetulpa field, the want of water was much felt, and the place could not be properly tested. In the mine a considerable amount of work was done in sinking and driving. The lode strikes N.E., and consists of irregular masses of quartz, with leaders, cutting through a thick bed of quartzite. The veinstone is white quartz, sometimes flinty, with cavities partly filled with clay and quartz crystals. A micaceous clay, probably a decomposed dyke, is associated with the reef, and also contains gold. The reef apparently occupies fissures caused by the upheaval of the strata in the form of an anticlinal arch. One shaft was sunk into the slate which underlies the quartzite, and is in blue calcareous slate with iron pyrites. S., on the same line, a shaft was sunk on a formation of quartz veins between smooth walls; these veins also contain gold. Other small veins were found to be auriferous here and near the alluvial gully discovered by Messrs. Mellor Brothers. By continuing the present shaft it would be found whether there were other auriferous veins at the junction of the hard and soft strata. In the neighborhood there are also small ironstone and quartz veins, striking E. and W. through slate. S. of this mine there are ironstone and quartz veins traversing slate country. One of these worked to a depth of about 15ft., and the quartz obtained was said to have yielded 3½ozs. of gold per ton. It is probable that when the rich formations

have been sunk through other reefs will be found beneath near the junction of the different beds. About 1889 the King's Bluff Mine ceased working, and the company went into liquidation.

In May, 1901, a new find was made in this locality, and the Inspector of Mines, reporting thereon, states that the Bluff stands fully 150ft. above the plain level, and is principally composed of slate and quartzite; there is a strong outcrop of the latter on the hilltop, and for about 2 miles in length, standing several feet above the surface in places, and throughout the formation, and for a considerable width, there are numerous quartz veins and leaders, of varying strikes. Towards the N.W. side many of these veins were worked some years ago by a number of cross-trenches and shafts, the deepest being 150ft.; results, however, were unsatisfactory, and work was abandoned. The new find is on the opposite side of the quartzite ridge, and has been exposed by an opening 8ft. deep, disclosing near the surface decomposed dyke matter, containing coarse specks of gold, which, as sinking progressed, became a fairly compact body of white quartz, apparently striking diagonally across the formation, 3ft. wide, and narrowing towards the bottom. This stone showed gold freely, and it was stated that a parcel of 5 tons, treated at the Wallaroo Smelting Works, averaged 3ozs. 8dwts. of gold per ton. About 80yds. to the E. a second opening, about 4ft. deep, exposed somewhat similar material, but no defined vein or lode so far; a prospect washed from this place gave over 1oz. per ton. In the block adjoining the prospector's, three open trenches have been made across the supposed line of reef, but so far nothing of importance discovered; the country is pegged east and west of the prospector's for fully 5 miles. Regarding alluvial, probably in places on the cap of the quartz formation a little may be found, but as the bedrock is quickly reached, and the gold is undoubtedly reef gold, no alluvial finds of importance may be anticipated. In July, 1902, the inspector reports further on the property, which was worked by the *Outalpa Proprietary Gold Mining Syndicate*. The formation and occurrence of the ore bodies are most peculiar, being a strong quartzite outcrop, resting on a band of talcose schist, striking about E. and W., with a S. underlie of about 45°. For a considerable distance on the line there are cross fissures, erratic in course, but with a general trend to the S. These appear to be the chief factors in the production of the ore bodies, which principally occur in isolated pockets and bunches, commencing from the talcose schist, and extending upwards from 5ft. to 15ft. in height, and gradually narrowing towards the top, until little can be seen beyond a small seam or joint in the rock, which, although small, is apparently continuous, and, if followed towards the surface, ore bodies may be exposed in the upper ground similar to those worked in the lower. The main shaft has been sunk to the depth of 443ft., on an average incline of 45°, the footwall being the band of schist. At various points from the surface down, pockets of ore have been disclosed, containing from a few hundredweights to several tons, all carrying more or less gold, some portions being rich, and composed of talcose schist and decomposed quartzite. At the shaft bottom, which is a little below water-level, this class of material has given place to slate, crystalline quartz, and pyrites, the latter being decomposed, and occurring in the joints and cleavages of the rock, with open cavities extending several feet beyond the face. Five samples taken from the various classes of material in the shaft bottom failed to disclose the presence of any metal. No. 2 shaft is about 250ft. E. of No. 1, and has been sunk to the depth of 170ft., on a similar underlie. The ore bodies are of similar character, but of much lower grade; they occur in considerable quantity down to 100ft. and below this the vein matter is small and poor. The main shaft, 343ft., S. of the tunnel is now down 34ft. through hard dense quartzite. At present it appears useless, but if future developments disclose payable ore in the upper ground it would then facilitate mining operations, and be useful for ventilation. No. 3 shaft is about $\frac{1}{2}$ a mile S.W. of the tunnel, and is 56ft. deep; for the first 20ft. it passes through quartz and gritty sandstone, which then gave place

to hard quartzite. A crosscut was driven 39ft. from the bottom, with the object of intersecting the quartz material obtained above, but was not successful. There is no indication of any defined lode, but it has more the appearance of an accumulation of quartz rubble, consolidated by time, formed horizontally on the quartzite. A sample from the ore dump, raised from the 20ft. level, yielded 7dwts. of gold per ton. In several other parts of the property there are a number of trial pits, cross-trenches, and small shafts, opened out on various formations, in which gold has been obtained, but, so far, not payable. One hundred and eight tons of stone has been treated at the Government works, Petersburg, for a yield of 331ozs. 9dwts. of gold, valued at £1,080. This is an exceedingly good average, and fully warrants putting rises from No. 1 shaft, at the most favorable points, as previously suggested. It would also be advisable to crosscut short distances from No. 3 shaft, to ascertain the extent and value of the material above the quartzite. The further sinking of No. 1 shaft is a prospecting venture; the absence of gold in the samples tried is not encouraging, but, from appearances, if continued another 70ft. or 80ft., more favorable country will be met with. (I.M.R., 22-7-02.)

Later returns show that the total quantity treated at the Petersburg Cyanide Works was 138 tons, which returned 346ozs. 0dwts. 20grs. of gold, valued at £1,102 6s. 9d., the average yield being worth 159s. per ton.

Work was abandoned by the Outalpa Company. A new find was made by prospectors in April, 1906, and a Departmental report states that it is situated about $\frac{1}{4}$ mile S.E. from King's Bluff trig., on the N. side of the large outcrop of quartzite, the highest point of which is the hill known as King's Bluff. It is about 8 chains to the E. of the main shaft, sunk by a previous company to the depth of 443ft. on the underlie. There are numerous other workings in the vicinity, and they extend to the E. of the present find. The quartzite spur, which runs about E. and W., is intersected at intervals by small quartz veins which, as a rule, strike N.E. and S.W. The quartz in these veins is glassy and barren at the surface, but they appear to be indicators leading to pockets or beds of quartz crystals and kaolin, carrying gold. Under one of these veins, about 2in. thick, strike 220°, dip vertical, an opening has been made in the side of the hill for a length of about 20ft., the end being about 30ft. below the surface of the hill. Gold was obtained all along this, and at the end about two-thirds of the face consist of quartz crystals and kaolin, showing gold freely. Rich specimens of gold in quartz are seen, and free filament gold is found throughout the mass. The drive is in quartzite rock, and slate outcrops in the valley below. There was no appearance of a defined lode or reef, and this seems to be an irregularly shaped body of auriferous material, associated with the quartz vein above mentioned, and similar in character to those previously worked in this neighborhood. A five-stamp battery was in course of erection. (D.R. (Gee), 21-4-06). Returns up to June 30th, 1907, show that 127 tons of stone had been treated on the mine for 250ozs. of gold, valued at £750, the average yield being worth 118s. per ton.

KIRKEEK'S TREASURE.—Situated on the Nillinghoo goldfield, 3 miles N.W. from Mount Victor trig. The Government Geologist reported upon this property at length in March, 1897. The main shaft was 210ft. deep. A lode of considerable width exists, which was thought to have been cut off by a slide or fault; but there is no proof of this, and the probability is that the lode will continue to greater depths. Where stoped out the lode was proved to be 10ft. to 15ft. wide in places, and it is fed by leaders and flat veins coming in from the walls. Another shaft has proved the lode to be of a good size E., and a cutting 272ft. E. of the main shaft has exhibited a wide lode formation of quartz and other lodestone. The strike of the line of reef is E. 10° N., dip about 80° in the vicinity of the main shaft. The lode formation has been traced along the line of reef 300ft., and has been proved in the main shaft to exist at a depth of 100ft. There is every reason to expect that it will continue at greater depth, and that large bodies of ore will continue to be met with. The Government Geologist was of opinion that this lode was well worthy of being

systematically and properly mined, and that the ore should be treated by the most approved methods. In 1895, 67 tons 17cwts. treated at the Mount Torrens Cyanide Works yielded on an average 1oz. 11dwts. 21grs. per ton.

In July, 1901, the mine was examined by the Inspector of Mines, who states in his report that about four years previously a large amount of work was done, and a five-head battery erected. The average value of the stone raised was good, and the lode formation large, but owing to the company not having made necessary provision for the conservation of water, only a limited quantity of lode matter could be treated, and that at a considerable expense; consequently, the battery was removed, and work discontinued until the beginning of 1900, when the ground was obtained by Mr. W. H. Carter, and work on a limited scale resumed, the ore being carted to Yunta, and treated at Petersburg, costing for carriage £2 4s. per ton. Operations were then in progress W. of and adjoining the previous workings, and consisted of some small shafts and an open cutting along the lode about 100ft. long, with an average depth of 25ft. The lode is, in places, 9ft. wide, and is composed of strong veins of quartz associated with iron, from 2in. to 18in. thick, with bars of slate and sandstone between, striking about E. and W., with a slight underlie to the S.; at both ends of the workings it continues strong and well defined. To the W. three prospecting shafts have been sunk, and about 1,000ft. S. a shaft has been sunk 200ft. in quest of water, not yet obtained; there is a good site for a tank, and a good catchment area in the vicinity. Eight samples from the workings gave the satisfactory average of 1oz. 15dwts. of gold per ton. (I.M.R., 16-7-01.)

Mr. Carter had 212 tons treated at the Petersburg Cyanide Works for a yield of 449ozs. of gold. Other parcels were also treated at Petersburg, the total quantity treated at the Government works being 485 tons, which yielded 780ozs. 11dwts. 9grs. of gold valued at £2,845 15s., the average extraction being worth 117s. per ton.

Another company was formed and a 10-head battery—being portion of the Alma Extended plant—erected. Returns to June 30th, 1907, show that 115 tons were crushed for 5dwts. per ton, and 130 tons for 10dwts. 19grs. per ton battery extraction. Inadequate water supply is still the difficulty (1907).

KITTICOOLOA.—*Vide* page 70.

KOH-I-NOOR.—Locality, about 15 miles S.W. from Kingscote, on Goyder's Range, Kangaroo Island. In 1886 the Government Geologist reported the existence of thin veins of quartz, some of which carried gold. The original prospector, E. Prime, drove a tunnel and sank a shaft, and, with Government assistance, put down another shaft from the top of the hill, but without special results.

In October, 1894, prospecting here was resumed, and in March, 1895, a parcel of over 10 tons of ore treated at Mount Torrens Cyanide Works gave an average yield of 1dwt. 16grs. per ton.

In April, 1905, Inspector Matthews reported that no work had been done here for a considerable period until about five months before the time of inspection, when the present holders started operations. The principal work has been confined to two shafts and surface openings. No. 1 shaft is sunk on the vein underlie to the depth of 130ft., being about 80ft. vertical. The country rock is chiefly slate and coarse gritty sandstone, the vein material in the upper portion being contracted in many places to a streak of siliceous lode matter from 1in. to 3in. thick. Towards the bottom the enclosing rock appears more settled, and the vein has improved considerably in width, but owing to the frequent breaks caused by faults running in a diagonal direction it is almost impossible to continue operations from the shaft bottom. At the distance of 180ft. N.W. of No. 1 a vertical shaft has been sunk to the depth of 186ft., and with the object of intersecting the vein formation a crosscut has been driven 90ft. It is anticipated the vein will be pierced within another 40ft.; this will be about 100ft. below the No. 1 shaft, and should go far towards proving the vein continuation, also its size and value in the more settled country. Seventy feet E. of the deep shaft an open cutting, 10ft. deep, has disclosed vein matter 2in.

thick, samples of which gave fair returns. This has probably been passed through in sinking the shaft about 50ft. from the surface. A trial crushing of 4 tons of stone recently treated at the Mount Torrens Government Cyanide Works gave an average of over 1oz. per ton. Five samples taken gave the following results:—

	oms. dwts.
No. 1.—From No. 1 shaft bottom	5 12 per ton
No. 2.—“ “	0 19 “
No. 3.—“ “	4 7 “
No. 4.—“ “	trace “
No. 5.—From open cut	2 17 “

This clearly shows that if the vein is small the gold contents are encouraging, and fully justify the expenditure for development at the lower levels, where the country rock will be of a more settled nature and the vein material probably more uniform in character. Should the vein matter prove payable when intersected in the cross-cut it will be advisable to sink a main shaft S.W. of the present workings to facilitate operations at a still deeper level. (I.M.R., 25-4-05.)

A Departmental report in November, 1906, states that a considerable amount of exploration work has been done by the present holders. Prime's tunnel has been extended to 200ft., and at the end a winze sunk for 50ft., also from the end a crosscut has been driven 130ft. N.E., about 125ft. below the surface. From the bottom of the original deep shaft, which has been deepened to nearly 200ft., a crosscut has been put in 150ft. S.E. From the old underlie shaft on the rise 45ft. deep drives have been made 30ft. N. and 60ft. S. Gold-carrying stone was found here and sunk on for 20ft. at a dip of 57° W. A new shaft 160ft. S.E. of the original shaft has been sunk for 72ft., and struck the gold-carrying vein or reef about 10in. thick, and connected up along it with the workings in the underlie shaft. This vein shows gold freely, and a sample from it assayed 3ozs. 11dwts. per ton, which is very encouraging, and should fully warrant the efforts being made to discover larger gold-bearing bodies of stone at this place. (D.R. (Gee), 27-11-06.)

In a report on Kangaroo Island of July, 1907, the Government Geologist, referring to the Koh-i-noor, says that this mine is situated on a spur of the tableland country; shafts and a tunnel have been sunk on quartz veins traversing argillaceous sandstone, clay slate, &c. The rocks containing are upheaved, and have an anti-clinal form, and the quartz veins are broken and irregular in size at 70ft., where quartz leaders in a lode formation show gold. An assay of the quartz returned gold at the rate of 18dwts. per ton. The influx of water below 70ft. has hampered prospecting, but the indications are favorable enough to warrant deeper sinking. (Government Geologist, 3-7-07.)

KUITPO, HUNDRED OF.

Bertram's Reef (Echunga) was taken up in 1872. The gold was first found in an almost flat bed of quartz, 13ft. wide and 3ft. thick, splitting up into leaders S. Twelve tons of this stone yielded 3½dwts. of gold per ton; and 20 tons, from a depth of 32ft., gave 6dwts. per ton. Shafts and cuttings were put in on a large quartz reef in yellow sandstone, grit, and quartzite, with kaolinised clay slate in bands. The deepest shaft was 80ft.

Big Ben.—Situated on section 393. This mine produced a quantity of very rich stone, and was worked for some time, but after a while the reef was lost and the mine was stopped. It is stated that subsequently the reef was recovered, and splendid specimens of stone taken from it. It was said to be 11ft. wide, and that a trial crushing of 5 tons gave a return of 15dwts. to the ton. In August, 1896, the Goldfields Warden reported that it was being worked by four miners, and that an adit was being driven into the hill to cut westerly shoots of gold. Some good stone had been taken out, but operations were discontinued soon afterwards.

Blackwood Gully is an alluvial diggings situated on section 626, and was discovered by a Government prospecting party in 1886. The gully has been worked for a distance of a quarter of a mile, and the sinking is shallow. At the upper part of the workings there are apparently several runs of gold, and at this point a wide area has been worked across the flat. Nuggets of moderate size have been secured, and some very rich specimens have been got in Couch's claim. They were found at a depth of from 10ft. to 20ft., in a vein composed of quartz, gossan, and kaolin. In April, 1887, $4\frac{1}{2}$ tons of stone were crushed by the New Era battery at Woodside, and yielded 4ozs. 11dwts. of gold. The bedrocks are kaolinised clay, and sandy slates, sandstone, and quartzite, traversed by quartz reefs and veins. It is probable that the alluvial gold has been derived from veins similar to those in Couch's claim, traversing the bedrock. This gully has been worked intermittently for several years. It is likely that a good deal of gold has been taken from it, but, in the absence of any records, it is impossible to form any idea of the amount. It was reported (5-10-95) that a 1lb. nugget was unearthed at these diggings by W. Randell, and subsequently that other finds were made in old ground.

Biggs' Flat.—A patch of rich ground was found here in 1877 by a Government prospecting party. The depth of sinking varied from 7ft. or 8ft. near the river to 36ft. at some distance from it. A good quantity of gold was got, of which the coarsest pieces weighed about 2ozs. Native copper was found with the gold. Other places on this flat were prospected, but, as far as is known, no payable results were obtained. The sinking varied from 25ft. to 30ft. in depth, and was very wet. It is probable that other leads of gold may be found on the flat.

Blackfellows' Creek Diggings were discovered about the 1st March, 1887. They are situated on section No. 292, and about $\frac{1}{2}$ mile above the junction of Blackfellows' Creek and the River Finniss, on an alluvial flat on the creek. The sinking varies from 8ft. to 10ft. in depth, and is wet. The gold found was fine. There are wide alluvial flats, and a large extent of Crown lands available for prospecting purposes.

An English company took up several leases here in order to conduct sluicing operations on a large scale. A dam was made and some 2 miles of fluming erected, but, owing to financial difficulties, operations ceased in 1897.

Bremer's.—Situated near Hahndorf. A shaft had (1891) been sunk 30ft., and a crosscut driven 10ft. in argillaceous slates and sandstone. At 200ft. W. a pit had been sunk 8ft. on a small vein of quartz. The Inspector of Mines thought the show not worth further expenditure.

Chapel Hill and Windlass Hill contained basin-shaped hollows, filled with boulder and pebble wash, rich in gold. From the vicinity of these basins several small leads of gold started. Yorkey's lead was followed down into Wattle Flat, where it became too poor to pay for working. Sandy's lead started at the surface, and yielded from one claim, 8ft. square, 25ozs. of gold and a nugget of 6ozs. in weight. A number of shafts were sunk, varying in depth from 10ft. to 120ft. on various leaders, one of which carries a little gold.

On the W. side of Chapel Hill gold was got at the surface; going W. the lead was found to pass over falls or precipices of 20ft., 15ft., and 10ft. in height, with flat spaces between. Where the bottom dipped towards these precipices there was the richest ground. They did not run straight; they were much cut under in places, and ran quite out at Bell's point. The gold was patchy, with narrow connecting gutters. In some places these were very rich, prospects having been obtained of 12ozs. to the tub, and 5ozs. or 6ozs. to the dish.

Chapman's Gully was the one first opened on the field, and proved to be the richest. At one place some rich specimens of gold in ironstone were found. An ironstone leader crosses the gully. The depth of sinking at the upper part of the gully was from 6ft. to 7ft., and 12ft. at the lower part. The gully has been worked, and was very rich up to the private property (section 3893), which, later, was worked under the Mining or Private Property Act; the area was small and the returns only fair.

Chapman's Gully Mine was started in 1881. The main shaft was put down 130ft., but no gold was met with. On a white quartz leader a W. underlie shaft was put down 40ft. It was driven on for a distance of 25ft., and a prospect of 2grs. to a dish was obtained. A second shaft, 44ft. deep, cut a gossany leader, dipping W., carrying gold. A third was put down on a white quartz leader carrying gold, and several other shafts were sunk to shallow depths. In 1899 it was in the hands of a company, who drove a tunnel over 100ft., some stone from which gave 1oz. 1dwt. per ton.

Christmas Rush.—Here the sinking was soft, and varied from 30ft. to 40ft. in depth. The bottom was uneven, and payable gold was obtained.

Comet Mine.—An engine shaft was sunk 130ft., and an underlie shaft was put down on a reef of from 2ft. to 5ft. thick. Ten ounces of gold were got from the crushing of a few tons of quartz. S. 3ozs. resulted from four dishfuls of dirt. A crushing of 10 tons gave 8dwts. per ton. Some prospecting was done in this mine during 1885-6, but no payable results were obtained, and the machinery was removed.

The Inspector of Mines visited this old mine in February, 1900. He reports that it is situated on elevated ground above the old alluvial workings. No work has been done for many years. The underground portions of the mine could not be examined, and very little reliable information could be obtained as to the size of the lode or its value; but, from an examination of the surface, there can be no doubt as to its auriferous character. Small ironstone detached lode croppings are scattered over the surface, the alluvial being too deep to allow the lode outcrop to appear. Apparently the mine developments must have been extensive, extending for fully 200yds. in length, consisting of several shafts, ranging from 50ft. to 115ft. in depth; the latter, which was the main shaft, was sunk vertical for the first 40ft., the remainder being on the lode underlie E. 2 in 6, the strike being N.E. So far as could be judged from surface appearances, the formation is from 2ft. to 4ft. wide, and is composed of ferruginous quartz and clay material of a favorable character. The country rock is soft friable clayslate and sandstone, easy and inexpensive to work. No further information is available beyond that already given. (I.M.R., 13-2-00.)

Crystal, formerly *Plane & Riddle's*, later called the *New Crystal*.—Locality, Jupiter, E. of section 330. The workings consist of an underlie shaft 110ft. deep, a vertical shaft of 20ft., and a drive of about 20ft. in length put in an E. direction from the underlie shaft at a depth of 70ft. The bedrocks consist of mottled kaolinised clayslates and sandy shales dipping E. The reef from which the gold is procured is composed of an irregular dyke-like mass of soft decomposed claystone, intermixed with quartz, and a ferruginous gossany lode formation, with veins of kaolin. Work done very limited (1884). An excavation of irregular shape had been made where the stuff had been stoped out, judging by which about 20 tons to 25 tons had been removed and washed. This is said to have yielded 428ozs. of gold, some of which was in small nuggets. The underlie shaft has reached the water level at 110ft., and in it there is another reef, lying more or less parallel to the one worked. Adjoining and near to this claim there are several others which have been worked and have yielded small quantities of gold. (1887.) Afterwards held in connection with the Phoenix, adjoining.

Phoenix.—Part of section 356, Jupiter Creek, and known as Wolters' claim. The sole work done by the proprietary of this claim was to sink a closely-timbered main shaft 11ft. by 4ft. 6in. down to 200ft., and driving 200ft. The intention was to go down with the shaft to a depth of 300ft. or 400ft.; but being unable to raise the necessary capital the company, seven months after incorporation, went into liquidation. (1887.) In November, 1890, the Inspector of Mines reported that the workings were on the same dyke as that operated upon by the Crystal Gold Mining Company. The country rocks are soft argillaceous slates and sandstone, enclosing a formation in which are small veins of gossan and

ferruginous quartz, and bands of kaolinised clay. A vertical shaft 215ft. deep has been sunk E. of the dyke, and on the W. a small vertical and underlie shaft 65ft. deep, and from the bottom of this a drive N. had penetrated 42ft. None of these workings yielded payable results, but a considerable quantity of gold had been obtained in former years. Held in connection with the Crystal by another company in 1895.

This company was wound up, and subsequently the Crystal portion of the property was worked by a party of miners who were unsuccessful. (1897.)

Diamond Gully.—A small quantity of gold was got in shallow ground, but it was not sufficiently rich to be payable.

Echunga Mine, originally known as the *Quartz Blow*.—Locality, Chapman's Gully. Gold was found in leaders by the alluvial miners in 1855, the surface leaders being very rich. The National Company purchased the claim, erected machinery, and sank a shaft 125ft. for water. Of this they got a good supply. In following the leaders down 30ft., a 5gal. bucketful of specimens is said to have contained £300 worth of gold. This company also prospected a large reef, but without any good results. On the ground again becoming open to miners small patches of gold were got from time to time, and on the discovery of a patch rather richer than usual in 1881, by R. and T. Hall, the claim was sold and formed into a company, called the Echunga Gold Mining Company. A large amount of work was done by the company, and in 1882 a 10-head battery was erected.

No. 1 whip-shaft was sunk to the water level, 90ft., and No. 2 shaft 70ft., with a drive, in which was cut a leader carrying gold. No. 3 shaft was sunk 50ft. in search of a leader in which gold had been found some years previously. The leaders dipped to the W. until they came to what is known as the "black leader." From this some good specimens were taken. Its thickness varied from 6in. to 16in. At a depth of 60ft. a large number of leaders were met with, averaging about 1in. thick. A crushing taken from a face of 7ft., in which were four leaders, went 2½dwts. to the ton; and a crushing of about 40 tons from the leaders yielded about 50ozs. of gold. A shaft was sunk to a depth of 250ft., and at 230ft. a drive was put in N.W. for 180ft., but nothing was found. A second drive was put in to the E. 220ft., and a bunch of mundic and copper ore was met with. Operations were discontinued, and the company wound up.

Echunga Government Prospecting Party.—Early in 1886 the Government decided to test the deep leads on Crown lands in the neighborhood of Echunga. The first locality selected was on sections Nos. 158 and 159, hundred of Kuitpo. Shafts were sunk, and the existence of a deep lead was proved. The washdirt consisted of waterworn quartz and other gravel, and was similar to that found to be auriferous in the old Echunga diggings. It occupied a watercourse of over 300ft. in width, and varied in thickness from 1ft. to 2ft. The bedrock was soft decomposed slate and pipeclay. A drive of 260ft. was put in from the main shaft at a depth of 65ft., and was driven across the lead near its junction with the wash. The dirt was tested with the dish for the whole length of the drive. In appearance it was most favorable for gold, and there were all the indications usually found in similar drifts and well-defined gullies, and yet not a trace of gold was found. This is extraordinary, and probably is the first instance in which an old Pliocene lead in a gold-bearing district has proved to be absolutely barren of gold. The second site selected was on section 337 and others adjoining, hundred of Kuitpo, and about 2½ miles S. from Echunga. Trial shafts were sunk across a wide extent of flat country and a lead was found. The deep ground had to be tested by boring, as the presence of drift sand rendered sinking difficult. Several bores were bottomed, but only a thin stratum of washdirt was found. The drift sand made the boring exceedingly difficult. As the bores progressed E. the ground became deeper until the lowest depth was reached at 110ft. At this point the work was discontinued, as the next bore would have come on private property. The manager of the party, Mr. G. Mellor, reported that to sink a shaft through the drift sand that he had met with

would involve considerable expense. Although the upper part of the lead has proved barren, yet the lower part towards the Meadows may be auriferous. But as the best sites for shafts are on private property, some time will probably elapse before anything is done to test the leads.

Electra.—Section 2791, hundred of Kuitpo. Some shafts were sunk, but no record of results to hand.

Farrant's.—Situated 2 miles from Hahndorf, and adjoining the Victoria Reef. The Inspector of Mines reported in June, 1890, that a large amount of work had been done in sinking and driving. The lode prospected was 5ft. wide, composed of quartzite with quartz veins; strike, S.S.E. and N.N.W., dipping W. at an angle of 35°. Enclosing rocks, argillaceous slates with bands of pipeclay. Samples taken did not return gold, but some gold must have been obtained by the owners, for they had spent thousands of pounds in fossicking over the surface. The property should be proved by deep sinking.

Golden Crown.—Adjoining the Kangaroo. The lode consists of white quartz, with cavities filled with clay and quartz crystals. Prospecting was proceeding in 1895 by drives at a depth of 35ft.

Golden Reef.—Three shafts were sunk to depths of 108ft., 110ft., and 50ft. The last one cut a leader at 25ft., which carried gold. The mine was started in 1882.

Golden Rise.—Locality, section 417, Kuitpo, near Donkey Gully. The Government Geologist reported in 1896 that two shafts had been sunk, and at 60ft. a drive had been put in to intersect the auriferous vein or veins supposed to have supplied the gold found in the neighboring gullies. He was of opinion that prospecting by trenches sunk into the bedrock and with the dish would have been primarily a more economical method of test as to the presence of gold in veins or reefs.

Golden Rise West.—This property has an area of 10 acres, and was regarded as having excellent surface indications of auriferous deposits. (1885.) At a shallow depth a 2ft. vein was struck, composed of gossany quartz and ironstone, enclosed in greenish clayslate rock.

Glen Dhu.—Workings on section 3501 (Mitchell's), near Prospect Hill, Kuitpo. The Inspector of Mines reported in June, 1890, that there was an outcrop of quartz, which had been sunk upon 43ft., but the lode had not been tested for width. Assays from samples he took showed that the lode was not payable, and his opinion was that it was not likely to improve.

Hahndorf Gully was discovered in 1856-7. The first payable gold was got by S. Jeffery, in about 7ft. sinking. Higher up the gully claims were bottomed at 20ft. The gold was rough and rugged. A branch gully was worked in 1872.

Hall's New Find.—Situated at the old Echunga Diggings. The Inspector of Mines in January, 1893, reported that Hall had put down two small shafts N. of the old shaft, respectively 18ft. and 20ft. deep. An irregular vein of ferruginous quartz, from 1in. to 4in. wide, had been cut, and Hall took out about 5ozs. of gold. From another pit, and from the same vein apparently, another digger took out about 11ozs. of gold; and other diggers had been more or less successful on that lead.

Jackman's Mine.—Drives and shafts to depths of from 30ft. to 60ft. were put down to prospect veins of quartz, ferruginous quartz, and ironstone, traversing quartzite grit and argillaceous sandstone. There are no well-defined walls, the formation being merely a collection of veins; some of them contain pyrites. In one of the drives a dyke-like mass of kaolin, with quartz and small veins of decomposed feldspar, and quartz and mica, has been cut, and might be prospected for gold with advantage.

Jupiter.—Jupiter Creek and the S. portion of Long Gully, discovered in 1868 by T. Plane and H. Saunders, who received a reward of £250 from the Government. White Gully, Surface Point, Foster's Gully, and Golden Point were all payable shallow diggings, draining into the main gully. The gold was nuggety, the largest weighing about 13ozs. One storekeeper purchased about £3,000 worth of gold

from Jupiter Creek, and on July 31st, 1871, the Warden of Goldfields estimated that £60,000 worth of gold had been obtained from this place. Rich finds of vein gold in kaolin and earthy-vein deposits were made at this place (of which the Crystal is an instance) and at Little Bendigo. These mullock reefs appear to be decomposed feldspathic veins or dykes, associated with quartz and ironstone leaders and gossany lode formations. None of these deposits have been followed below the water-level, where the veinstone is likely to be undecomposed. The discoveries at the Crystal show that extraordinarily rich patches of gold exist in them. Additional rich patches may be expected to be met with in following down the formation to deeper levels.

Kangaroo Mine.—This was discovered in 1872, and a company was formed. A small crushing, taken from a W. leader, from 4in. to 6in. thick, gave gold at the rate of 2ozs. to the ton. A shaft 95ft. deep was then sunk; at 50ft. the reef was cut, and a drive S. was put in a distance of 100ft.; a crushing gave less than $\frac{1}{2}$ oz. per ton. Another shaft was sunk 150ft., with a drive of 250ft., but no reef was cut. The mine was then abandoned. In 1881, however, work was resumed, and a crushing from the 95ft. shaft yielded $\frac{1}{2}$ oz. per ton. A main shaft was then sunk 100ft., and a battery and machinery erected. The works were then stopped, owing probably to want of funds. Six tons of quartz were crushed by Mr. A. von Doussa, at Hahndorf, and yielded 8ozs. gold; the stone was from a leader, which on being followed pinched out.

King Mine was started in 1881. An underlie shaft was sunk on the reef to a depth of 120ft. At 71ft. the reef was 4ft. thick, and a drive was put in along its course; 10 tons of quartz yielded 1 $\frac{1}{2}$ ozs. of gold; 250yds. to the E. another shaft was put down to a depth of 50ft.; here the reef was 3ft. thick, and 10 tons of quartz gave 1oz. of gold.

Lawrence's Claim.—Three shafts were sunk to depths of 20ft., 28ft., and 35ft., at distances of 20ft. to 30ft. apart, and were connected by drives, in a soft decomposed sandy and micaceous slaty shale, through which pass a number of small leaders. Near the surface these veins are composed chiefly of kaolin, becoming mixed lower down with glassy and ferruginous quartz and ironstone. In them, near the surface, some rich patches of gold were found, but owing to their number and irregularity, the run of the gold is difficult to follow. Comparatively little work has been done. There was no crushing apparatus, and the gold was washed out with cradle and dish. It is impossible to ascertain the total amount of gold found, the only certain information being that 41ozs., of the value of £157 16s. 10d., was sold to the Melbourne Mint shortly after the work began. The gold found was often in filaments: the largest piece, when cleaned, weighed 2ozs. The mine was discovered in 1884. In 1885 20 tons of stone were raised, and were crushed at the Ridge battery, Woodside. The yield of gold was 1oz. 6dwts. 6grs.

Long Gully.—Three companies were formed in 1866 to work the cement (or conglomerate) in this gully.

In 1868 Breakell & Co. erected crushing machinery and sank a number of shafts ranging in depth from 50ft. to 100ft. A reef was cut at 70ft., and a bucketful of stone yielded 1oz. 3dwts. No payable results were obtained; the battery was badly placed, and seems to have been badly worked. Gold can be seen in some of the heaps of cement raised for crushing.

Mizpah.—This is situated near Mount Pangæus, on the Hahndorf Road. The Government Geologist, reporting upon the property in June, 1896, stated that there were three shafts in direct line, each cutting the lode formation, which runs due W., and is about 3ft. wide, with slate walls, and consists of parallel shoots of ferruginous quartz in intervening bands of pipeclay. Gold was visible in two shafts, and prospects were obtained in every dish; water exists at 24ft. Alluvial claims were worked many years ago in this locality with good results. Nothing has been done below water-level, the owners being unable to cope with the inflow. It is believed that capital could be profitably spent upon this property.

Mount Monsier.—See page 251.

Mount Pangæus.—Situated in Hahndorf Gully, about 2 miles from Hahndorf; area, 25 acres. The Inspector of Mines stated (1889) that a tunnel had been driven 666ft. into the mount, and an air-shaft was being sunk. Two reefs had been intersected, which should unite at about 80ft. below the tunnel level.

May Queen.—Situated in German Gully. In sinking, a reef 4ft. wide was found at a depth of 30ft., with gold distributed in the quartz. A trial crushing returned $\frac{1}{2}$ oz. per ton. A strong pumping plant was required to keep the water under.

McMurtrie's Claims.—Situated on Blackfellow's Creek, hundred of Kuitpo, 5 miles S. from Prospect Hill. The Inspector of Mines reported that there is a strong well-defined reef, on the average 3ft. 6in. wide, principally ferruginous quartz, carrying a layer of plumbic schist, and in this flaky gold could be seen. An average-looking stone taken from the footwall of reef assayed 1oz. 15dwts. gold per ton, whilst the schist, in which no gold was visible, yielded 8dwts. 5grs. Course of reef, N. 10° E. From a shaft 40ft. fully 100 tons was taken out. At the S. end a shaft has been sunk 20ft.; reef, 3ft. thick, carrying free gold. (1889.)

New Rush was discovered in 1858 or 1859 by a party of eight prospectors, who were rewarded by a grant of money from the Government. The prospectors also discovered gold at Blacksand Corner and at other places, which have since been worked. Two or three months after the first discovery payable gold was struck, and yielded from 12ozs. to 14ozs. to the load of dirt. The gold was scattered along the foot of a precipice 10ft. to 15ft. high, on a flat bottom. The sinking ranged from 20ft. to 30ft. in depth, and was very hard, owing to the beds of gravel and cement.

North Warrakilla.—N. of and adjoining Bell's Warrakilla. In 1895 and 1896 a few shallow shafts were sunk with unsatisfactory results.

Onkaparinga River Diggings were discovered in 1870 by Messrs. Scudds. The river flat was found to be auriferous as far down as Pennyweight Flat. The payable gold was found between the waterholes; some of these were pumped out, but very little gold was found in them. Seaman's Point was the richest part of the river; payable gold was also got at Blacksand Corner, and near Biggs' Flat; at Hack's Bridge also it was discovered, but not worked.

Poor Man's Gully and Poor Man's Hill.—The sinking was through hard gravel and cement, varying in depth from 1ft. to 30ft. It was stated that payable gold and also diamonds were found here.

Queen Mine (Section 3851) was discovered in the year 1871. Gold was found on the surface, in a leader which yielded 40ozs. of gold. Subsequently 5 tons were crushed and gave 5dwts. per ton. In 1881 the ground was taken up by a company. They erected a battery, and pumping and winding machinery; and sank a shaft 100ft. deep, with a drive 100ft. W. A reef was cut 14ft. wide carrying a quantity of mundic, and was driven upon N. To the N. of the main shaft two other shafts were sunk, and were connected, at a depth of 25ft., by a drive 180ft. long; 23 tons of stone were crushed and yielded 4 $\frac{1}{2}$ ozs. of gold. In October, 1894, work was recommenced, and in 1896 the Inspector of Mines pronounced this to be a very promising looking property.

A Departmental report in February, 1905, states:—The only workings accessible are those at 35ft. from surface, where two levels have been driven and connect with vertical and underlie shaft at that depth. The hauling shaft is 35ft. deep, and at the bottom a crosscut has been made S.E. for 5ft. and N.W. for 7ft. From the end of this E. crosscut a level has been driven S. 23° E. for 76ft., at 42ft. crosscuts have been put in N.W. for 23ft. and S.E. 20ft., which disclose a formation 23ft. thick consisting of soft kaolinised micaceous slate and sandstone, with ferruginous quartz and gossan and ferruginous claystone in bunches connected by small veins and segregations. N.W. from the shaft a level has been driven S. 35° W. and some stoping done; owing to falls of rock, &c., this level is blocked up for the greater portion of its length, but where it is accessible ferruginous quartz occurs

for the full width of the drive. This level is connected with the water shaft by a crosscut. Four samples of veinstone from the level gave, on assay, from nil to 3dwts. gold and a trace of silver per ton. From the end of the N.W. crosscut from the hauling shaft, a level has been driven N. 10° E. 60ft. and N. 50° E. 17ft., and connects with Holmesby's shaft at the end; it has also been driven S. 10° W. 54ft., all through soft kaolinised sandstone and puggy slate, with irregular seams and bunches of ferruginous quartz and iron oxides and ferruginous clay. Two samples from this level, on assay, returned respectively 5dwts. and 6dwts. gold per ton. About 8ft. above this level an adit was driven, and the two levels are connected by a small winze. In the adit level ferruginous quartz is visible on the hanging-wall side for the full length of the adit accessible, portions having fallen in; the formation also carries lumps and pockets of kaolin, mica, and quartz grit. These appear to be fragments of granite which have been enclosed in the lode formation and subsequently decomposed. What appears to be the footwall consists of soft friable sandstone, and the hanging-wall kaolinised slate; but owing to the shallow depth of these workings neither of the so-called walls are at all well defined.

From a report of the last mine manager, when the mine was in regular work, the following particulars have been obtained:—"From the shallow workings described above a large quantity of the reef stuff was raised and put through the battery, and although the machinery was very primitive and rudely erected, from 4dwts. to 5dwts. of gold per ton were obtained. A further parcel of 23 tons of ore from the same workings yielded 4½ozs. of smelted gold. A main vertical shaft was sunk to a depth of 103ft., and from the bottom a crosscut was driven 97ft. W. and cut through a lode 13ft. in thickness, composed chiefly of pyrites, with quartz. A drive 4ft. wide was put in N. along the footwall and disclosed similar material for that distance. A few tons of ore from this lode was put through the battery, but the crude machinery could not save the gold contained in the pyrites. The walls are uniform."

Samples of the pyrites on surface near the shaft and of tailings from the battery gave the following results, viz.—Pyrites, 2dwts. gold per ton; tailings, 7dwts. gold and 4dwts. silver per ton.

The timbers of the main shaft have burnt out above water-level and the collar has collapsed.

During 1896 a parcel of ore 3 tons 12cwts. was treated at Mount Torrens—1oz. 6dwts. 12grs. gold recovered by battery, 1oz. 7dwts. 7grs. gold recovered by cyanide, total 2ozs. 13dwts. 19grs. (D.R. (George), 16-2-05.)

Rodet's Claim.—N. of the Comet Mine, 2½ miles from Mylor, at the head of Snowball Gully. A shaft was in progress 25ft.; it was intended to continue it to 60ft. and then crosscut for the formation, which is apparently very much broken and disturbed. The material is ferruginous quartz and slate, from which the alluvial gold found in the gully has doubtless been shed. The prospect is a fair one, and the ground being easily worked, it can be tested at a small expense. (I.M.R., 13-2-00.)

Sailor's Gully, discovered in 1872, contained a lead of gold extending the whole length of the gully. The sinking was in hard and dry alluvium, and to a depth of from 6ft. to 15ft. The largest nugget found weighed 4ozs.

Saunmill Gully, discovered in 1872, yielded nuggets, the heaviest of which weighed about 1oz. Gold in quartz was also found. The sinking was wet, and the depth ranged from 1ft. to 10ft.

Simond's Gully.—Three or four claims were payable. Professor Ulrich, in his report (1872), states that a great portion of the gold found in Felter's Flat and Chapman's Gully was not waterworn, but hackly and crystalline; a circumstance indicating that, whilst the waterworn gold came from the denuded Pliocene drifts, the hackly and crystalline were derived from the quartz reefs in the immediate vicinity.

South Crystal.—Situate in Jupiter Gully. A great deal of work was done, and numerous quartz stringers met with in the drives, and some leaders were found.

The Inspector of Mines expressed the opinion that what the prospecting undertakings wanted in this neighborhood was a trial sinking to a depth of 500ft. before driving or crosscutting. (1889.)

South Bohunga.—Started in 1881; machinery was erected, and a main shaft was sunk to a depth of 180ft., but no reef was found.

Sunny South.—Situated in Sailor's Gully. The Inspector of Mines in 1890 reported that four shafts had been sunk and drives put in upon this property. The lode is from 18in. to 3ft. wide, carrying gold, and the country rock is soft argillaceous slate. The gold was very fine, and required special treatment, and the property, in his opinion, was well worth thoroughly testing.

The Stirling Reef.—The first gold obtained was found on the surface by a man named Scudds. He showed it to Messrs. Bowes and James, and they began to work on the spot. Finding the gold was not alluvial they took up a reef claim, and after sinking to a depth of 4ft. came upon some gold-bearing leaders in the slate and greenstone. Good results were obtained by simply crushing and washing the stuff. Feeling, however, that they could do but little without capital, Messrs. Bowes and James sold their lease to an Adelaide company for £100 cash and 250 paid up shares. A five-stamp battery was put up, and work was continued for about 12 months. The profits were not, however, sufficient to cover the expenses and the work was stopped. During the next nine months tributaries made very good wages in working it. The property then passed into the hands of the late Thos. Breakell. Five more stampers were added to the battery, and a tramway was laid from it to the mine. Crushing was carried on for about 18 months and the mine was then abandoned. The material crushed consisted of quartz and ironstone leaders and a greenish soapy stone known as "green dyke." The richest gold was found in the last-named stone. The mine has been abandoned for a considerable time. The place where the work was carried on is marked by a large open cutting in grit, slate, sandstone, and conglomerate. The conglomerate is composed of kaolin and water-worn quartz, with mica and feldspar crystals. In the hard rocks magnetic iron-sand is plentiful, and quartz and ironstone leaders are visible to a small extent.

Professor Ulrich visited and reported on this mine in 1872, and says the reef runs between micaceous sandy slates and massive beds of coarse felspathic quartz-grit at a strike of N. 30° E., dipping apparently vertical, whilst slate and grits, though showing the same strike, dip E. 30° S. at 60° to 63°. The workings extended about 6 chains along the strike of the reef, the principal one being a wide quarry-like open cutting, several chains in length and 10ft. to 14ft. in depth, at the up-hill end; further on follows a large open pit, and beyond this, right on the top of the spur, are several shafts, in all of which the auriferous mullock has been struck. As regards its character, he did not consider it a genuine quartz reef, but more nearly resembled what, in Victoria, are called mullock reefs. He compared it to a large fissure, in places 30ft. and 40ft. wide, filled confusedly with masses of the wall rock-grit and slate. The interstices between these masses are filled with mullock enclosing irregular pockets and veins of quartz, through which rather solid crystalline specks of gold are distributed. Irregular veins cross the mass in all directions, horizontally, vertically, and obliquely. Consequently, as each vein cannot be separately followed, the reef has to be quarried out, and the stuff subsequently classed. This, besides being a troublesome process, is also one during which it is impossible to prevent a large quantity of poor matter getting mixed with the quartzose mullock, and thus producing the low yield of 2dwts. to 2½dwts. per ton average. There can be no doubt but that this reef largely contributes, by denudation, to the gold found in the Onkaparinga River. Professor Ulrich was of opinion that, on a large scale, the reef might be profitably worked, and that there was a chance of its becoming much better defined in depth.

Small efforts have been made from time to time to rework this property, but so far nothing practical has come of them.

Victoria Mine (Sailor's Gully), was discovered in 1872. The lode consisted of hard quartzite, interlaced with gold-bearing quartz veins. It was very rich near the surface. The deepest shaft was 70ft. to the water-level, with a drive of 70ft. to the reef. Shafts, trenches, and open workings were put in along the outcrop of a quartz reef striking N. and underlying E., through quartzite, sandstone, and kaolinised clayslates.

The Inspector of Mines, reporting in 1889, recommends that the reef should be proved below water-level.

Victor George Mine was taken up and worked in 1881, on a brown ferruginous leader dipping W., and from 1ft. to 2ft. thick. One hundred feet E. of the reef a shaft was sunk 70ft., with a drive 100ft. to the W. Five tons crushed yielded ½oz. to the ton. Other shafts and tunnels were put in on hard massive quartz veins in sandstone and quartzite. (1887.)

Wattle Blossom.—Situated at Jupiter Creek, near the Phoenix and Crystal Mines. It was restarted in July, 1896, with the intention of trying to discover the continuation of the Crystal ironstone lode.

Warrakilla (Bell's).—On sections 418 and 507. The workings are in a dyke-like formation composed of soft decomposed rock intermixed with gossany quartz and masses and veins of kaolin, similar in many respects to the "mullock reefs" mentioned under the heading *Jupiter*. The gold was first obtained by washing, and the harder material was afterwards crushed. Very good returns have been obtained, particularly in 1896-7, when the property was first worked. In May, 1897, 9cwts. returned 14ozs. 13dwts. 4grs. of free gold. Very fine specimen gold was found, both of gold and bismuth, fantastically intermixed, and also of the rare crystalline gold.

Warrakilla South.—There were in May, 1897, four shafts, totalling a depth of 150ft., and a drive 275ft. Besides the lode strong seams of quartz and gossan were encountered. Assays were stated to have yielded 4dwts. per ton.

Warrakilla South Extended.—In a drive 30ft. (August, 1895) several leaders had been met with, one carrying colors. In August, 1896, it was stated that nothing payable had been struck.

Warrakilla Broken Hill.—In November, 1895, a drive was being put through the hill. Between sandstone and slate a deposit of quartz containing pyrites was found, and was regarded as promising.

Winlass Hill.—A reefing prospecting area, on which, in July, 1895, a leader was struck, giving colors of gold.

NOTE.—The bulk of the early information regarding the Echunga field has been extracted from the Government Geologist's "Notes on the Echunga Goldfield," Parliamentary Paper, No. 32 of 1885.

The records were, for the most part, obtained from men working on the diggings in 1884, and who were acquainted with the operations carried on by the various companies. It is noticeable that a small amount of work only has been done in testing the reefs at a depth. Where deep shafts have been sunk the reefs met with have not been followed or worked in a systematic manner.

Echunga Proprietary Hydraulic Gold Shuicing Company, Long Gully Hydraulic Gold Shuicing Company.—These companies are conducting operations in Long Gully, but so far the results have not been satisfactory. (1907.)

LITTLE GEM.—Situated 13 miles from Willunga, near Blackfellow's Creek; has been prospected for about 10 chains in length by a tunnel and several small trial shafts. The tunnel has been driven 70ft.; the lode is very irregular, but has a general course of N. and S., underlying E. Near the tunnel entrance the vein is 2ft. wide, but gradually narrows to 6in. in the face; it is apparently making a splice, and will probably increase in width as the tunnel is continued; it is of a siliceous nature, associated with auriferous-looking iron. N. No. 1 opening is 5ft. deep,

disclosing similar lode matter 18in. wide. No. 2 opening, 14ft. deep, with vein 15in., with clean and well-defined walls. No. 3 opening is also 14ft. deep, with vein 6in., and similar walls. Beyond this, the vein can be traced for a considerable distance, but no work of any consequence has been done to prove its size or value. Six bulk samples taken from stone raised gave small results, the best being 3dwts. gold per ton, from the vein in No. 2 opening. The inspector approves of the mode of prospecting in operation. (I.M.R., 11-12-03.)

Lux, also previously named *Mingary* and *New Mingary*.—Locality, New Luxemburg, 14 miles E. from Olary Railway Station. This property included a number of claims, among them the *Bismarck* and *John Brown*.

The New Luxemburg reefs were discovered in 1887, and in a report dated May 29th, 1888, the Government Geologist, after giving details of the various workings, concludes by saying—"The rocks in the locality are metamorphic and intrusive, the former being represented by metamorphic granite, generally gneissic, mica schist, hornblende schist, and other metamorphic hornblende rocks, into which have been intruded veins and dykes of coarse granite, to which the metamorphism is due. It is probable that besides the eruptive granite diorite dykes will also be found in sinking, as this rock generally accompanies the metamorphosed hornblende rocks—to which it is closely allied. The geological structure of the locality is very similar to that of the Barrier country, and is a continuation of the same formation, which, however, ceases about a mile and a half W. and S., where the slate country begins. The reefs are situated near the boundary of the granite and metamorphic rocks and the slates. The formation is also similar to that of Yudnamutana and Neales River districts, where gold occurs. No drives have yet been put in along the reefs, the quartz now on the ground having all been obtained in sinking the shafts. There are many varieties of veinstone here, viz., quartz rock, micaceous ironstone, gossany quartz with iron ore and gossan, brown iron ore, and copper carbonate.

The percentage of copper is very slight in most of the lodes, but it may be expected to be met with more abundantly in time; but even should this prove to be the case it is not likely to interfere with the extraction of the gold above water-level.

The richest specimens of gold are seen in the gossan and quartz of the Prospecting, or Bismarck, claim, in quartz at the John Brown claim, and in gossan at the Queen Bee claim. These quartz lodes are the largest, best developed, and most permanent in appearance yet discovered to be auriferous in the North-East. Owing to their great width large quantities of quartz can be raised at a small cost, and a low average yield of gold here will pay better than a high average where the reefs are small. The whole of the claims will, of course, not be found to be payable, but when the auriferous "shoots" come to be followed down it is to be expected that many of them will yield payable stone, and in some rich discoveries of gold be made." (Government Geologist, 29-5-88.)

The Bismarck prospecting claim is where the first discovery of gold in this locality was made, by Messrs. Smith and Bottcher, in 1887.

The Bismarck shaft is 50ft. deep, and is sunk perpendicularly on a quartz vein, in which, not far from the surface, coarse gold could be seen. The vein occurs in a solid hornblende rock resembling amphybolite. In Strawbridge's shaft the reef is over 4ft. wide. The quartz contains carbonate of copper and gossan, and fine gold can be obtained by crushing and washing. (1889.)

The John Brown reef forms part of the Lux. Shafts were sunk along the line of reef, and gold could be seen in the surface quartz and gossan. A crushing of 5 tons from the vicinity of the John Brown shaft averaged 18dwts. gold per ton. The country rocks are metamorphic micaceous granite, with coarse eruptive granite dykes. (1889.)

For years work was carried on under great difficulties, so that the mine has never yet been properly developed. There are a number of reefs on the property, some of which gave rich specimens of gold. The Inspector of Mines (1895) was of opinion that 8dwts. to the ton should pay. There were 20 men employed at the

time of his visit. Financial reasons led to the holders letting out the mine on a tribute, and later work ceased. With a reasonable amount of capital the mine should prove a profitable undertaking. (1899.)

Operations were not resumed, and the company was wound up.

LADY JANE.—Situated about 8 miles E. of Callington Railway Station. Three shafts have been sunk within 1 chain in length, the deepest being from 70ft. to 80ft. The country rock is micaceous schist of a favorable character; the lode material consists of micaceous quartz, strongly associated with iron, and is apparently of a fair width. Stone raised from the bottom of the deepest shaft shows copper stains and small prills of ore, but so far of little value. The vein appears of an auriferous character; the country rock is of a soft nature, easily worked, and any further prospecting should be from one of the present shafts. Three samples taken from the various ore dumps returned traces of gold. (I.M.R., 25-4-02.)

LAMBERT'S.—Situated at Paratoo, 7 miles N.E. from Nackara Railway Station. The Inspector of Mines reported in May, 1894, that little work had been done, and up to date nothing of a payable nature found. About a year later the Inspector found that an underlie shaft had been sunk 115ft., a vertical shaft 28ft., an underlie shaft 30ft., and one 20ft. vertically and 70ft. underlie. Fair stone was being raised that showed gold very freely, and the reef was in some places 5ft. wide, composed of ferruginous quartz and ironstone. The Inspector stated that the country was auriferous for miles round.

LAURA SYNDICATE.—Operations in progress in 1895 at Lovely Gully. The Inspector of Mines reported that an underlie shaft was down 160ft., and that a vertical shaft cuts it at 68ft. At the 110ft. level a drive had been put in 14ft. The vein of ore was exceedingly small, both in the bottom and in the drive. Some rich specimens were obtained from this property.

LEY'S.—Locality of workings, a mile and a half S.W. of Copperalinka Dam, and $9\frac{1}{2}$ miles from Olary Railway Station. The Inspector of Mines in 1892 reported that shallow pits had been sunk on small ferruginous quartz veins, which carried 1dwt. of gold per ton. A vertical shaft had been sunk 16ft. on an ironstone and quartz lode 4ft. 6in. wide, and striking E. 10° N. Samples taken gave an assay return of 1oz. 18dwts. per ton. This should be tested in depth.

LOVELY GULLY.—*Vide* page 211.

MALPAS'S SECTION (Hundred of Adelaide).—In April, 1895, it was reported that gold had been found on section 5660, at the foot of Black Hill. The Inspector of Mines reported that a small cutting had been made in a bank of alluvium; and the owner had stated that from half a ton of material 6dwts. of gold were obtained and that 11 tons produced 8dwts. The Government assay from alluvium and bedrock gave no return of gold. There was, in the opinion of the Inspector, no sign of a lode.

MANNAHILL.

The first official notice of the discovery of gold on this field is contained in a report from Mr. Bedford Hack, Warden of Goldfields, dated December 2nd, 1885. He describes the locality as being on the Oulnina Run, 5 miles N.W. of the Mannahill Hotel. The depths of the workings varied from 1ft. to 3ft. Samples of stone showing gold freely were brought down by the warden.

The Nectar and No Gammon reefs were the first found, and later on the Birthday, Elsie May, Aurora Australis, Westward Ho!, Jackson's, and other reefs.

There are three localities where mining is being, or has been, carried on, viz., at the Nectar and No Gammon claims, on a belt of reefs known as the Birthday and Aurora Australis, and at the Elsie May reef.

THE BIRTHDAY LINE.

This line of reef extends E. 30° N. about 1 mile. The country rocks here also form an anticlinal arch, dipping at a low angle to the S., but steeper to the N. Quartz, ironstone, and gossan reefs cut through the bedrocks at various angles from 40° to 60° ; they dip S. In some parts of the line there are two or three parallel reefs.

The prospecting claim, McEvoy's, is situated about 8 miles from the Mannahill Well, and on a bearing of about W. 10° N. magnetic. Several shafts and excavations have been made, commencing near the western boundary. The first is about 14ft. deep, on a large quartz and ironstone reef about 4ft. thick, striking E.N.E., in clay and calcareous cleaved slates. Two tons of crushing stuff have been raised, consisting of ferruginous quartz, quartz, iron ore, and gossan, with a little iron pyrites. In the middle of the claim a cutting has been made, its greatest depth being 8ft. across the veins, the largest being 2ft. thick. The underlie of these veins is S.S.E. The E. workings comprise a cutting some 10yds. long, along a reef striking E.N.E., and having a width of from 6in. to 18in.; small specks of gold were to be seen in some of the material raised. A crushing of $6\frac{1}{2}$ tons from this place, mixed with $1\frac{1}{2}$ tons from Gibbons' claim, further E., was crushed at Waukaringa, and yielded 15ozs. of gold (McEvoy).

Going E., Gordon and Stirling's claim is the next adjoining McEvoy's; the first excavation is about 12ft. deep, on a reef of quartz and ironstone, with gossany cavities. The second 15ft. deep, on a large reef 6ft. or 7ft. thick, underlying S.S.E. 45° . The third working is a shaft 30ft. deep on a reef from 2ft. to 3ft. thick in the bottom, where it shows a considerable amount of gossan. About 18 tons of crushing stuff have been raised on this claim from the two parallel reefs prospected.

Haycock's claim adjoins the last mentioned. Here an underlie shaft has been sunk 28ft. between two quartz and gossany quartz veins some 3ft. apart; in the bottom of the shaft two other leaders show; they underlie S. and E. 45° to 50° ; 12 to 15 tons of crushing stuff have been raised. From two holes near the shaft a trial crushing of 5cwts. was obtained, which yielded 14dwts. of gold.

C. Smith's Claim.—An underlie shaft has been sunk 15ft., two veins dipping S.S.E. 60° . About 5 tons of crushing stuff have been raised.

Ivey's Claim.—Two or three small veins have been exposed by trenches and shallow shafts; they have the same underlie and belong to the same belt of reefs as those further W. An underlie shaft has been sunk 18ft.

Gibbons & Company.—Here an underlie shaft has been sunk 34ft., on a vein of ironstone and quartz, having a width at the bottom of 1ft. The second underlie shaft further S. has a depth of 27ft., and exposes a reef which is from 1ft. to 2ft. thick at the surface, and underlies at an angle of 70° S.S.E. From this claim $1\frac{1}{2}$ tons of quartz were crushed with $6\frac{1}{2}$ tons from McEvoy's Prospecting Claim, as previously mentioned; this mixing of the quartz was doubtless accidental, but has rendered the results from both claims uncertain. The specimens shown to me by the proprietors contained the coarsest particles of gold I saw on the field. About 11 tons of crushing stuff have been raised here.

Goshen Claim.—Four or five shafts of an average depth of 8ft. or 10ft. have been sunk on veins of quartz, ironstone, and gossan.

H. Konig's Claim.—An underlie shaft about 25ft. sunk on a small vein.

H. Werner's Claim.—A shallow underlie shaft has been sunk on a small vein, dipping 60° S.S.E.; about 3 tons of quartz have been raised.

Continuing E. along the line many claims have been pegged out and prospected, but only to a small extent.

Jenkin's Claim is the most E. in work. Here some 3 tons of quartz have been raised from a large blow of quartz, iron ore, and gossan in one place, and a similar quantity from two other places, at a depth of 12ft., where there is a reef 2ft. to 3ft. thick. Here, as well as in some of the other claims near, calcspar (crystallised carbonate of lime) is associated with the vein quartz. Returning to McEvoy's claim, and proceeding W. along the line, the claims are as follows:—

Christmas Day Claim, Roberts & Co.—An underlie shaft has been sunk to a depth of 65ft. at an angle of 55° to 60° , on a reef ranging in width from 6in. to 1ft. This reef has been passed through near the bottom of the shaft, and two veins or leaders

struck in the hanging-wall. The reef, besides brown iron ore and ferruginous and white quartz, contains mundic; small specks of gold are sometimes visible in the stone.

Moore's Claim.—Three or four shallow shafts have been sunk on two small parallel veins, which underlie to the S.S.E., but are less inclined in that direction than the veins in the other claims; specks of gold have been seen in the stone from the southern vein.

Padmore & Co.—A shaft has been sunk about 30ft., and 4 or 5 tons of quartz raised. This reef also contains mundic.

All these claims adjoin one another along the line or belt of reefs, extending in an E.N.E. direction for about 1 mile. They in some places conform to the bedding of the rock for a short distance, at others they cut across it, and apparently fill up fissures made by faults in the strata. The strike of the rocks is roughly approximate to that of the veins, and they dip in a S.S.E. direction at a low angle. The rocks consist of clay and sandy slates, claystones, and calcareous claystones. The general strike of this belt of rocks is E.N.E., and the general underlie S.S.E. The veinstone is composed of a hard glassy and white quartz, with cavities containing gossan, ferruginous clay, iron oxides, and pyrites, and admixtures of these with quartz. The gold occurs in fine particles, and is generally contained in the iron ore and siliceous ferruginous rock, though sometimes seen in the quartz. Owing to the nature of the veinstone, it is difficult to discern the gold without crushing and washing the material. Many of the reefs contain traces of copper. The free gold has doubtless been derived from the decomposition of the pyrites.

THE AURORA AUSTRALIS LINE. (*Vide* also page 245.)

This belt of reefs lies N. of, and roughly parallel to, the Birthday Reefs, at a distance of 20 to 30 chains. Claims have been taken up from opposite McEvoy's Prospecting Claim, in a S.W. direction, for a mile or so. The following claims are being prospected, commencing at the N.E. claims and going S.W. :—

Dalton's Claim.—Here a large outcrop of quartz occurs, and a trench has been cut.

Roberts & Co.'s Claim.—Holes have been sunk in three or four places on large reefs and blows of quartz and iron ore, and a shaft sunk to a depth of 30ft. on a large reef of quartz, iron ore, and gossan, with a considerable quantity of iron pyrites. The reef is from 3ft. to 4ft. wide in the bottom of the shaft, where it shows a slight N. dip. Fourteen tons of quartz have been raised here. Further S. a shallow shaft exposes similar stone from 2ft. to 3ft. wide, on the same line as the first shaft. There is another shaft 15ft. deep on a vertical reef containing much pyrites. Four tons of crushing stuff have been raised here.

Elliott & Clarke's Claim.—Here a shaft has been sunk 12ft. on a reef which is from 12in. to 18in. wide, striking N.E. by E. There is also a shaft 20ft. deep on a vertical reef, which is from 12in. to 18in. thick. Pyrites is here associated with the oxide of iron. About 4 tons of quartz have been raised.

Lester's Claim.—Here there is an ironstone vein striking E.N.E., and dipping S.S.E., which has been sunk on in two places, and about 2 tons of stuff have been raised for crushing.

Roberts & Padmore, Golden Hill.—Two veins of quartz and ironstone have been prospected, and about 2 tons raised. A shaft has been sunk 13ft. on a large reef of quartz, gossan, and ironstone. The strike of this reef is N.E., and it underlies N.W. 70°.

Holmes & Radford have sunk a shaft about 30ft. on a quartz and iron ore reef. There are several veins more or less parallel in this and the adjoining claims.

Putt's Claim.—Similar veins are being prospected here.

The large reefs on this line seem to have split up in this direction into several parallel veins or leaders. I am not aware of any of the stone from this part of the field having been crushed.

THE ELSIE MAY REEF (*vide* also page 244).

Goslin's Claim is situated about 2 miles in a W. direction from the prospecting claim. This reef has been prospected in several places, and trial crushings taken from two places. At the E. end the deposit of iron oxide and gossany iron ore, of which the veinstone is composed, lies almost flat on the top of a low spur, cropping out to the surface N. and dipping gradually S., where it has a steeper inclination. The thickness of the deposit varies from 12in. to 18in. Six tons have been crushed from this part of the reef. In a W.N.W. direction, some 700ft. distant, a crushing of 6 tons has also been taken out from an outlying patch of iron ore and gossan, a foot or more in thickness, which is apparently a portion of a flat reef outcrop, which has not been denuded from the crown of the hill. These 12 tons of ore have been crushed at Waukaringa, with, I am informed, a satisfactory yield of gold.

Potter's Claims are about 300yds. S. of Goslin's reef. A number of claims have been taken up on a quartz and iron ore reef, with a low inclination to the S. No work is being done on this line at present.

NO GAMMON REEF (*vide* also page 243).

This is situated about 5 miles N.W. of Mannahill. Several holes have been sunk, and trenches cut to a shallow depth, for a distance of about 20 chains. Commencing at the E. the first hole is 3½ft. deep, and is in brown iron ore and quartz, which apparently form the broken up outcrop of a reef; the second hole is 6½ft. deep, in rubbly quartz, gossan, and iron ore, also the broken up outcrop of a large reef; the third is a shaft 20ft. deep, in rubbly quartz and soft calcareous clayslates; the fourth is an excavation 2ft. to 3ft. wide and 8ft. deep, in broken ground, apparently the top of a large reef (about 15 tons of stuff have been raised here); the fifth is 15ft. deep, in it a flat ironstone and quartz reef 2ft. to 3ft. thick has been sunk through and followed for a few feet on its underlie; the sixth is an excavation 15ft. deep, in kaolinised and calcareous clayslates. Besides these there are other holes and excavations, including a trench some 70yds. long and 2ft. to 4ft. deep. The Nectar claim is ½ mile W.N.W. of the No Gammon claim. On a N.E. line, included in the distance of 50yds., there are no less than six shafts. Commencing at the E. end, the first shaft is 18ft. deep; 6ft. from the surface a flat vein of ironstone was passed through; the second shaft is 14ft. deep; here gossany ironstone veins intersect the hard calcareous slates and limestone rock; the third shaft is 9ft. deep; the fourth and fifth each 15ft. deep. In all these ironstone leaders or veins traversed the joints of the bedrock; none of these are large; they are often intermixed with quartz and rubbly stuff, forming a network of veins. The sixth shaft is 20ft. deep. Here, in sinking, 6ft. of reef, chiefly quartz, which crops out S.E. and underlies N.W., was passed through. A drive is being put in in a N.W. direction from the bottom of this shaft, following a rubbly formation, the continuation of the reef, which has a gentle inclination in the same direction. Rocks here are hard and broken. The ironstone leaders cut across the bedding of the rocks, whilst the quartz reef just mentioned conforms more or less to the same. In this case, and also in those of the No Gammon and Goslin's claims, I believe it will be found that the flat veins and reefs lie in the crowns of anticlinals, or arches, made by the undulations of the strata between the hard and soft beds, which are also intersected by other veins cutting across the strata, and branching into them after the manner of what are known as saddle reefs. It is, therefore, likely that other similar reefs exist beneath the footwall of these flat reefs, and will be come upon by sinking vertically through the rock beneath them into the underlying strata. It is more advisable, however, to follow down the veins, which, although they conform to the stratification of the rocks in some places, also cut across them in descending below the surface. From this claim 2 tons 8cwts. of ore were smelted at the Intercolonial Smelting Works, Spotswood, Victoria, and yielded gold at the rate of 2ozs. 17dwts. 3grs. to the ton, and 2 tons 6cwts. crushed at Waukaringa averaged 2ozs. 11dwts. per ton. From the nature of the stone found in this field—composed as it is of quartz, hematite,

brown iron ore, iron pyrites, siliceous iron ore (ironstone), and gossan—it is difficult to see the gold without crushing and washing the material; the gold is generally in small particles, and where such is crushed and washed shows good prospects. Specimens with visible veins were shown me at the No Gammon and Nectar claims, also at McEvoy's, Gibson's, Roberts's, Christmas Day claim, Moore's, Goslin's, etc., etc. Owing to the scarcity of water on the field, the crushing and washing of prospects is not much resorted to as a means of ascertaining the presence of gold. I would recommend miners to make a practice of trying prospects more frequently, as by doing so they may be saved the trouble of raising stone which may not be payable.

Lead ore—galena—occurs in a large quartz reef near the Nectar claim in small quantities, and also some 3 miles N.W. of the prospecting claim, Birthday reef, in a siliceous, ferruginous, and gossany veinstone striking E. and W.

Taken generally the prospects of these reefs are very encouraging, although there is no reason for supposing that all the claims taken up will be payable; the gold being, as usual, in shoots and patches, which will have to be followed. From the abundance of iron oxide in the veinstones it is safe to infer that when the water-level is reached they will chiefly consist of iron pyrites, which is already present to some extent in some of the reefs near the surface.

Of the stone procured by me on the field and since tested by crushing and washing, that from the No Gammon and Nectar claims shows most gold. All specimens in which a single speck of gold is seen when crushed show numerous other particles of that metal. Eleven samples, consisting of gossan, quartz, pyrites, and tailings, which were assayed, were found, with the exception of two, to contain gold, thus showing that the gold is widely distributed. The extent of country occupied by these reefs is large and the reefs numerous and well defined, and persistent along the strike; the rocks they traverse are similar to those found to contain auriferous veins in other parts of the colony.

Probability of Alluvial Gold.—On the Salt Creek and in its vicinity there are wide alluvial flats which it would be advisable to prospect for gold, as, owing to the presence of water, there would be no difficulty in doing so. Up to the present time no effort worth mentioning has been made to try for alluvial gold, either here or in the immediate neighborhood of the reefs.

(Government Geologist, 19-6-1886.)

Additional Notes and Information, 1898.

In August, 1886, the Mannahill Goldfield, 120 square miles in area, was proclaimed, and on September 3rd, 1886, 50 bags of ore, representing samples from 10 different claims, were collected by the Warden of Goldfields and forwarded to the School of Mines, Ballarat, for treatment, as a test of the value of the ore for gold. The returns were as follows:—

Locality.	Yield of Gold per Ton.	
	dwts.	grs.
Elsie May Reef	5	23
Holmes & Radford's	5	7
Holmes' (Golden Hill)	2	18
Roberts' (Aurora Australis)	10	9
Golden Crown (Birthday Reef)	5	17
Star of the East (Birthday Reef)	2	16
Haycock's Claim (Birthday Reef)	6	11
McEvoy's Claim (Birthday Reef)	3	6
Nectar Reef	5	2
No Gammon Reef	5	2

These bulk assays appear to have been treated by crushing and amalgamation in the ordinary way, but no returns were given of the gold remaining in the tailings.

In November, 1886, 200 bags of ore, taken from five different claims, were forwarded by the Government Geologist to Melbourne and treated by the "Newberry Vautin" chlorination process. The full return is given in the following table:—

Name of Reef or Claim.	Weight of Stone Treated.		Yield per Ton.		
	tons	cwts.	ozs.	dwt.	grs.
Aurora Australis Reef	2	2	0	2	5
Haycock's Claim (Birthday Reef)	2	1	0	2	13
Westward Ho! (Holmes & Radford)	1	15	2	0	5
Nectar Claim	2	1	0	13	4
Star of the East (Birthday Reef)	2	0	0	6	7

The belt of reefs, of which the Westward Ho! and Trojan reefs form the E. and W. extremities respectively, extends in an E. and W. direction for $3\frac{1}{2}$ miles along a line of broken ranges of low elevation. The auriferous veins, or reefs, outcrop irregularly and intermittently, and are almost invariably flat or undulating near the surface, but gradually dip S., the angle increasing the further the veins are traced in that direction. This is due to their being interstratified or segregated between the bedding of the country rocks, which have all along the line been upheaved into a low anticlinal arch, accompanied at the N. side by numerous faults, running also in an E. and W. direction, and dipping vertically. These bedded veins are associated near the outcrop with veins and reefs, often of considerable size, cutting through the strata at various angles.

The veinstone consists of quartz, hematite, brown iron ore, gossan, jasper-quartz, ferri-calcite, calcspar, and other calcareous and siliceous materials.

With the exception of the Westward Ho! Mine, the numerous reef outcrops along this line have been only prospected. As a rule the veins are not of sufficient size or importance to warrant more than this. At the same time it is most probable that some of them, if followed down on the underlie, will be found to increase in size.

These veins may be found to occupy their present position with regard to the strata when followed deeper, or may cut through the strata and become true fissure veins at a depth. Judging from the fact that they have been deposited in the spaces left between hard and soft beds of rock, caused by upheaval of the strata, it seems most probable that other similar vein deposits would be found by sinking vertically through the subincumbent strata.

The country rocks are calcareous clayslate and limestone, argillaceous sandstone and micaceous slate, dipping S. at a low angle (10° to 15°).

The *No Gammon Mine* was discovered by H. Mills, in 1885, who at that time was prospecting for alluvial gold in the locality. The latest workings comprise an underlie shaft, about 60ft. deep, dipping at an angle of 27° N., on a formation composed of kaolinised slate and sandstone, with quartz bunches and ferruginous veins, between walls from 4ft. to 6ft. apart. Several shafts from 20ft. to 30ft. deep have also been sunk on quartz and ironstone reefs. No record of results is obtainable. Mine abandoned.

The country rocks consist of argillaceous slate and sandstone, blue calcareous slate and limestone, forming an anticlinal arch, in the bedding of which the veinstones chiefly occur. (*Vide* also page 241.)

The *Nectar Mine* was discovered by Roberts shortly after the No Gammon Mine was started. Numerous shafts have been sunk to shallow depths, and cuttings made, over an area of about $\frac{1}{2}$ an acre of ground. Some of the shafts have fallen in, and it was therefore impossible to examine them. The deepest shaft is about 30ft. deep.

The country rocks are argillaceous slate and sandstone, calcareous clayslate, and limestone in anticlinal form.

The gold was found to occur principally in the small veins of iron oxide and ferruginous quartz intersecting the strata. The larger quartz and ironstone veins which conform to the stratification contain little or no gold. April, 1886—Two

tons 6cwts. yielded 5ozs. 18dwts.; June, 1886, 2 tons 8cwts. smelted, yielded gold at the rate of 2ozs. 17dwts. 3grs. to the ton.

The Trojan.—Discovered by Jackson. The veinstone consists of quartz, ironstone, and gossan, forming irregular deposits in the crevices of an anticlinal caused by the upheaval of clay and calcareous slates and sandstone. The strike of the veins is E.N.E. and dip S., increasing gradually in that direction to about 45°. Copper pyrites and green carbonates of copper are associated with the veinstone. As the workings have fallen in, no information on this point could be obtained by inspection. Previous to 1887 $4\frac{1}{2}$ tons of ore yielded at the rate of 1oz. to the ton.

The Eudunda Hope (*vide* also page 246).—Found by Wm. McEvoy in 1886, and afterwards worked by a Eudunda syndicate. There are numerous shallow workings following ironstone, gossan, quartz, and jaspery quartz veins horizontally disposed in the bedding of the rocks in some places, in others occurring vertically. The general dip of the veins is to the southward, but they have not been followed far in that direction. A large quantity of ore now lying on the surface has been raised from these cuttings. A vertical shaft about 4 chains S.W. of the other workings has been sunk 110ft. in calcareous clayslate to water-level. Five tons of ore crushed at the Salt Creek Battery in March, 1887, gave a return of 6ozs. of gold.

ELSIE MAY REEF (*vide* also page 241).

An undulating reef outcrop, consisting chiefly of brown iron ore and hematite, varying in thickness from a few inches to 18in., interstratified with argillaceous, calcareous, and micaceous slates and sandstones, striking nearly E. and W. and dipping S. at a small angle. A crushing of 70 tons was made in 1887 for a return of 4ozs. 2dwts. of gold; abandoned.

EASTWARD HO! REEF.

An undulating outcrop of ferruginous quartz and ironstone dipping S. 10° interstratified with calcareous and micaceous slates and sandstones. No returns; abandoned.

Westward Ho! Mine (*vide* also page 247).—This mine was discovered in 1886 by Messrs. Holmes and Radford. Later the mine became the property of Dr. Dixon, who erected a 20-head battery and worked it for some time. The reef is large, and strikes E. and W., and underlies S. at an angle of 20°. Near the surface the reef is composed chiefly of iron oxides and gossan, gradually turning into pyrites as depth is attained. A little copper is contained in the pyrites in places.

The water-level now averages 35ft. from the surface.

The country rock is blue calcareous clayslate and limestone. The dip of the reef conforms to the bedding of the country rock as far as followed down.

In 1887 a crushing at the Salt Creek battery of 25 tons returned 31ozs. of gold.

No returns are obtainable during the time the mine was worked by Dr. Dixon. It is generally understood that owing to the refractory nature of the ore a large percentage of the gold could not be extracted by the methods then adopted. The Inspector of Mines in 1889 estimated this loss at 10dwts. to the ton.

About this time the mine was closed by Dr. Dixon, since which no work of any consequence has been done, but returns for 1898 show that 3,000 tons of tailings treated by Deeb's agitation cyanide process yielded 675ozs. of gold.

Two inclined shafts 110ft. apart were sunk, connected at the water-level by a drive. Between these shafts, and to the E. and W., the ground has been partly stoped, as the reef was from 2ft. to 15ft. thick. A vertical shaft was sunk 320ft. S. No information could be obtained with regard to the mine below water-level. The reef apparently has a much steeper inclination S. at water-level.

This pyrites lode has not hitherto been mined in a workmanlike manner. With proper management, and the employment of the latest methods used in extracting metals from this class of ore, mining on this lode might prove profitable. It is not unlikely that the iron pyrites will be, to some extent, replaced by copper ore at a depth.

THE AURORA AUSTRALIS LINE (*vide* also page 240).

This belt of reefs extends in a N.E. direction for 60 or 70 chains. Near the N.E. end it includes large massive quartz reefs, vertical and slightly inclined, containing gossan, pyrites, iron oxide, and attaining a thickness of 5ft. and 6ft.

Towards the S.W. end the reefs thin out into quartz veins from 3in. to 8in. in thickness, well defined and steeply inclined S., containing a large proportion of brown iron ore. The bed rocks are argillaceous sandstone, claystone, and mudstone. Their general dip is S.E. 17° to 20°. No further work appears to have been done on this reef subsequent to the previous report.

Galena.—A small vein of galena occurs near the E. end of the Elsie May reef, and also at a place 2½ miles N.E. of the Birthday. The latter returned an assay of 23ozs. 10dwts. 9grs. of silver per ton.

Euro Mine.—A bedded formation, consisting of slate and sandstone containing iron oxide in veins and bunches accompanied by quartz veins and ironstone. The country rock consists of sandstone and calcareous sandstone and slate, forming a broken or faulted anticlinal. In November, 1897, a parcel of 12 tons of ore was treated at Petersburg Government Cyanide Works, and yielded 2ozs. 7dwts. from battery treatment. The tailings contained 2ozs. 7dwts. of gold.

Homeward Bound Mine (*vide* also page 246).—The reef consists of ferricalcite and calcite, with quartz and gossan, containing a little carbonate of bismuth and gold. It strikes E. and W. and dips S. at an angle of 25°, and is from 3in. to 10in. in thickness. A parcel of 5 tons of ore treated at Kapunda yielded 14dwts. 13grs. of gold.

So far the prospecting done on the numerous reef outcrops has not afforded great encouragement to the gold miner, although here and there rich specimens have been occasionally unearthed; but it must be borne in mind that at the time the field was worked the present cheap processes for extracting finely divided gold from low-grade ores were not in use, consequently only ore containing visible gold could be economically crushed.

The assays given below are from samples recently taken from the reefs:—

	Gold.			Silver.		
	ozs.	dwts.	grs.	ozs.	dwts.	grs.
Westward Ho!—No. 1	0	6	0	0	2	4
" No. 2	trace			trace		
" No. 3	"			"		
" No. 4	"			0	2	10
" No. 5	0	9	21	0	3	4
" No. 6, pyrites	0	16	18	0	6	2
" No. 7	0	18	10	0	1	4
" No. 8	0	9	21	0	3	4
" No. 9 " *	trace			1	4	0
Eudunda Hope	0	13	6	0	1	10
" Pyrites	trace			trace		
"	0	7	18	0	10	5
"	0	7	0	0	9	0
"	0	6	0	0	4	0
Aurora Australis (Roberts' Claim)	trace			0	2	10
"	"			0	2	10
No Gammon	"			trace		
"	"			"		
"	"			"		
Birthday Reef (McEvoy's Claim)	"			"		
"	"			"		
Homeward Bound	"			"		
" ↑	"			"		
"	17	16	0	1	2	0
Euro	1	5	7	0	4	2
" ↑	32	5	0	2	12	0
Silver-lead Reef	trace			23	10	9

* Copper, 31 per cent.

† Picked specimens.

(Government Geologist, 1898).

Eudunda Hope (*vide* also page 244).—Vertical shaft put down 110ft., which passed through pyrites and galena in a small vein. There was also some costeaning done, but operations ceased for lack of capital. (1888.) In 1898 the Mines Department raised and forwarded two parcels of ore and sent it for treatment at the Petersburg Cyanide Works. Thirty-two tons 15cwt. were treated and returned 7ozs. 18dwts. 13grs. of gold, valued at £30 13s. 4d., the average extraction being worth 18s. per ton.

Homeward Bound (*vide* also page 245).—Located 8 miles W. of Mannahill. The lode has been traced through the full length of the W. block, and for a considerable distance through the adjoining one, and from the little work done and discoveries made on the property adjoining the E. boundary there is no doubt that the lode continues through the full length of the four blocks. In places lode cropings can be seen on the surface, in others it is overlain by sandy loam; for over 30 chains in length it has been explored by numerous cross trenches, in most instances disclosing lode material from 4in. to 18in. in width, containing gold and bismuth in places. The principal work is on the W. block, and consists of two shafts and two open cuts, extending for about 350ft. in length. No. 1 shaft, sunk on the vein underlie to a depth of 104ft., discloses lode material from 9in. to 18in. in width, striking E. and W., with a S. underlie of 45°; at the 48ft. level two drives have been made E. and W. on the course of the lode, 21ft. and 100ft. respectively, each exposing the same class of material—siliceous calcite associated with iron, and about 18in. thick. No. 2 shaft is about 160ft. W. of No. 1; present depth 50ft. from the surface on the underlie, and exposes material of the same class and of about the same width as previously described. No. 1 open cut is about 138ft. in length, with an average depth of 8ft.; the vein, similar to that in No. 2 shaft, is exposed in the bottom for the full width. No. 2 open cut is about 3 chains W. of No. 1, and shows the vein, as in No. 1. There are other shallow workings still further W., which prove the lode to be persistent in its course and uniform in its character for a considerable length. Care is taken in the separation of the ore containing bismuth, and requiring special treatment from that sent to the cyanide works. Nine samples taken by the inspector from different portions of the workings gave returns from 1dwt. to 40ozs. 19dwts. gold, and from trace to 2.8 per cent. bismuth per ton. The returns showed that 116 tons treated at Petersburg yielded 10dwts. 17grs. of gold per ton, and 10cwt. of bismuth ore sent to Queensland for special treatment, 13½ozs. of gold, no return for bismuth. Recently a further parcel of 170 tons sent to Petersburg gave 39ozs., making the average of the whole parcel a little over 10dwts. per ton, which is satisfactory, and will warrant future vigorous working. For the future development, the main underlie shaft should be continued, in order to explore the lode and obtain a supply of water. Eventually it will probably be found advisable to sink a main vertical shaft, to intersect the lode at a depth of about 300ft., and connect the same with the underlie shaft. (I.M.R., 17-3-02.)

In June, 1904, Mr. J. Gottlieb secured the right to work this property, and with a party forwarded to the Petersburg Cyanide Works 43 tons 3cwt. 2qrs., which gave the splendid return of 337ozs. 10dwts. of gold, an extraction per ton of 7ozs. 16dwts. 10grs. of gold, worth £3 19s. 11d. per ounce. The total ore treated at the Government battery was 367 tons 7cwt. 2qrs., which returned 532ozs. 11dwts. 16grs. of gold, valued at £2,092 6s. 6d., the average extraction being worth 114s. per ton. A 10-head battery is now being erected at the mine, and a dam has been sunk for a water supply. (1907.)

Klondyke.—On the continuation of Homeward Bound reef, adjoining the Homeward Bound Mine on the W. Twenty-eight tons 18cwt. treated at the Petersburg Cyanide Works returned 65ozs. 9dwts. 17grs. of gold valued at £257 18s. 3d., the average yield being worth 178s. per ton.

Spanish American.—Situated on the Homeward Bound reef, adjoining and W. of the Klondyke. Three shafts sunk, two 15ft. deep each and one 85ft. deep. In the former the vein averages 12in. thick, carrying more or less gold throughout,

some of the assays giving high results. The deep shaft has been sunk on the lode underlie, which inclines rapidly to the S. For the first 50ft. the vein is of a rubbly nature, very much broken, and averaging about 9in. thick; below this it is more solid, composed of siliceous material, strongly associated with iron, and towards the bottom about 12in. thick; in some places showing traces of bismuth, which doubtless occur in streaks and patches, and indicate the richer portions of the material. A 5-ton parcel from the upper workings, treated at the Government works, Petersburg, gave 5dwts. per ton; the ore at the bottom appears more promising. The sinking of the underlie shaft should be continued, to ascertain the size and value of the lode, prior to sinking any vertical shaft. Sample of ore from shaft bottom, 85ft., yielded 3ozs. 11dwts. of gold per ton, with trace of bismuth. (I.M.R., 2-4-02.)

Waterhouse's Claim.—Adjoining the E. boundary of the Homeward Bound. Two openings had been made, the deepest, 10ft., exposing a vein formation 9in. wide, apparently the same body as being worked in the Homeward Bound. At the time of the inspector's visit it was simply a prospecting venture, and little work had been done. (I.M.R., 2-4-02.)

Westward Ho!—From this mine $1\frac{1}{2}$ tons of ore sent by the Government to be treated in Melbourne gave a return of 2ozs. 6dwts. per ton. The mine became the property of Dr. Dixon, and a 20-head battery was worked. The reef is large, runs E. and W., and underlies S. at a low angle. It is composed chiefly of iron oxides and gossan, and has every appearance of being permanent, and can be easily mined. Water-level, 60ft. The Inspector of Mines reported, in 1889, that thousands of tons of vein material had been dealt with, but the gold, being fine, had escaped into the tailings to the extent of fully 10dwts. to the ton. The sulphide ore had been proved to carry over $1\frac{1}{2}$ ozs. to the ton, a portion being free gold. From the concentrates 68ozs. 8dwts. and 21grs. gold and 3ozs. 5dwts. 8grs. of silver per ton were obtained; and the tailings of the concentrates showed 16dwts. gold to the ton. Recently the tailings lying there were treated, resulting in a bar weighing 104ozs., valued at £4 2s. 6d. per ounce, obtained by the Deebie process. In December, 1898, this property was examined by the Government Geologist. He states that the main inclined shaft had been sunk 72ft. below water-level, and that at the bottom there had been a drive put in for 50ft. A large pyritous lode, varying in thickness from 5ft. to 10ft., a continuation of the lode worked on the surface, is disclosed, and looks to be strong and permanent. The veinstone is chiefly iron and arsenical pyrites, associated with quartz, ironstone, and gossan; and it has been followed from the surface 225ft. The samples taken from the bottom and the end of the excavation gave good assay results, up to as high as 1oz. 9dwts. per ton, and show that the lode at the deepest point reached is rich in gold. The vertical depth from the surface is only about 50ft., and, taking into consideration this fact, together with the size of the lode and the large quantity of auriferous pyrites that could be cheaply obtained by a proper system of mining, it is almost certain that satisfactory results would accrue if skilfully worked. (1899.)

The Inspector of Mines (Mr. W. H. Matthews), reporting in April, 1900, states that the lode has been explored on the surface by small shafts and trenches for over 200yds. in length, but so far nothing of importance had been discovered, except in the main inclined shaft, which has been sunk to a depth of about 220ft., being only about 55ft. vertical. The lode on the surface, and for some depth in the shaft, is from 12in. to 18in. in thickness, but as it continues down makes very much larger, being at the bottom from 8ft. to 10ft. thick. It is composed chiefly of ferruginous matter from the surface to the 200ft. level, some portions containing a much larger percentage of iron than others. On this a large amount of work has been done, the gold apparently making in irregular shoots and bunches for about 150ft. in length, some portions being of very high grade. Below the 200ft. it has changed into a pyritic lode, containing a large quantity of sulphur and arsenic, which cannot be successfully treated by the ordinary milling process. Three

hundred and fifty feet in a S. direction from the inclined shaft a vertical shaft has been sunk to the depth of 71ft. ; its continuation should shortly pass through the lode, should the ore body continue the same course ; but from appearances this seems doubtful, as the indications are in favor of the underlie being more vertical than hitherto. Bulk samples taken from the bottom drive of the main shaft gave 4dwts. and 14dwts. of gold, and two samples from bottom of the shaft gave 2dwts. and 6dwts. per ton ; also one from the stopes gave 5dwts., the total giving an average value of slightly over 6dwts. per ton. By further sinking the gold contents may possibly improve, and to determine that point the sinking of either the inclined or the vertical shaft should be continued. (I.M.R., 27-4-00.) *Vide* also page 244.

McLEAN'S.—Adjoining the Walter Outalpa, near Walparuta Springs, on an alluvial flat. It was examined in 1895 by the Inspector of Mines, who reported that prospecting operations were in progress, by which means a lode had been traced, which seemed continuous and worth prospecting.

MEDORA MINE.—Adjoins the Mount Grainger Mine on the S. In October, 1897, it was reported that the lode had been struck at 45ft. in the two vertical shafts sunk, and that gold was showing freely. At the Petersburg Cyanide Works a parcel of 19½ tons of ore was treated August, 1898, which returned 42ozs. 11dwts. 21grs. of gold. The total quantity of ore treated at the Petersburg Cyanide Works was 200 tons, which returned 182ozs. 6dwts. 23grs. of gold, valued at £694 9s. 9d., the average extraction being worth 69s. per ton.

MID-ALMA.—Situated between the Alma and Victoria and the East Alma, and the two lodes in it strike E. and W., one averaging 1ft. and the other 1ft. 6in. in width. Two shafts have been put down to the respective depths of 296ft. and 93ft., both following the dip of the lodes ; and there is a drive of 80ft. The ore matrix is quartz intermingled with ironstone, the country rock being argillaceous sandstone. The total amount expended to April, 1890, in the development of this mine was £3,917 12s.

MINTARO ALLUVIAL DIGGINGS.—Locality, section 2153, and a small adjoining reserve, hundred of Stanley. The gold, says the Government Geologist, is found on two bottoms, namely, in the surface loam and gravel, from a depth of 6in. to 1ft. or 2ft., and in red clay and wash underneath, and which rests upon the bed-rock, and is of an unusually good quality ; some is waterworn, and nuggets of a few ounces in weight have been found. Gold has also been found in other places in the vicinity. No well-defined quartz reefs or igneous dykes are visible, and the gold may have been derived, as at Echunga, from small kaolin and ironstone veins. The rocks are favorable to the occurrence of gold, and places where there are cap-pings of Tertiary gravel and conglomerate, as well as the gullies and creeks of the district, might be tested for gold. (1892.)

MONTACUTE MINE.—This mine is mentioned under the head of "COPPER," but it is said to have also yielded gold. No reliable information has been obtained beyond the fact that samples from the lode, on washing, gave good colors. It has been stated that during the time the mine was worked, viz., 1844-51, assays showing gold up to 4ozs. 13dwts. 8grs. per ton had been obtained.

MONTE CHRISTO (Sullivan's Claim).—Locality, 1 mile N.E. from Mount Victor. The Inspector of Mines examined this property in October, 1894, and reported that there are several strong outcrops of lodes, and on the E. slope of a hill a shaft cut one of them at 20ft., passing through it at 30ft., and drives were put in. Paint gold was visible on some of the stone, and samples taken gave an assay result from a trace to 1dwt. per ton. In another shaft, 35ft. deep, a strong vein strikes E. and dips S. Further prospecting in depth recommended.

MOPPA GOLDFIELD.—Locality, 2½ miles from Greenock. It was reported that alluvial diggers did well here between 1893 and 1895, two men obtaining 28ozs. of gold, one piece weighing 19dwts. 17grs. Subsequent workings proved that the

gold was to be found in irregular patches, and was difficult to trace. Sinking was from 12ft. to 30ft. in soft sandy clay. In the latter part of 1895 only a few diggers continued working there. The Inspector of Mines in 1893 reported that 20 men were working on alluvial on sections 7 miles S. of Kapunda, some of whom had obtained a little gold. Gold exists in reefs in the locality, and there is a considerable area of alluvial ground. Results up to that date had been poor, but little work had been done to prove the property. It was recommended to test a deeper gully S. of section 7, and one on section 5.

Moppa Hill.—In September, 1894, some men were obtaining gold near Fitzgerald's and on Heggie's and Johnson's land. Several men had been getting fair prospects. The gold was reported to be of good quality, being purchased at the Melbourne Mint at £4 1s. per ounce.

Heggie's.—In 1904 Inspector Matthews reports :—Situated close to the old Moppa Gold Diggings, hundred of Belvidere, 3 miles N.E. of Greenock township. The section (No. 6) is traversed by a low range of hills, of an auriferous character. For a considerable width there are numerous veins and quartz leaders. The principal formation showing on the surface extends over 10ft. in width; it consists chiefly of slate, ironstone, and quartz, striking N. and S., and underlying 45° E. On this several small openings have been made, and two or three small prospecting shafts, from which it was stated fair returns had been obtained, but, not having been worked for a considerable time, most of the workings had fallen in, and could not be examined. W. of the principal outcrop a shaft has been sunk over 60ft., and, apparently, a crosscut driven, but not far enough to intersect the main ore body. The waste material on the surface shows that veins of ore have been passed through, samples of which returned 1dwt. gold per ton; other samples tried from some of the openings gave little or no result. The property is undoubtedly auriferous, and for further prospecting it would be advisable to open up the various lodes and veins by sinking trial shafts, and cross-trenching on the surface. (I.M.R., 10-2-04.)

In June, 1905, 4½ tons treated at the Mount Torrens Cyanide Works returned 20ozs. 18dwts. 10grs. of gold, valued at £85 14s. 7d., the yield per ton being 4ozs. 12dwts. 23grs., the average value being worth 380s. per ton.

MORIALTA.—In 1890 gold was being found in gullies on the Morialta Estate, at the head of the Fifth Creek, in the hundred of Adelaide. It was of a peculiar character, being frequently found in flat pices, bearing serrated feather-like markings. The owner of the land bought 50ozs. of gold from the diggers, but there is every reason to believe that this represented but a small proportion of the quantity found. (See also "SILVER-LEAD.")

MOTTRAM'S.—Situated near Angepena. The Government Geologist reported (March, 1896) that a shaft had been sunk 60ft. in soft slate, near a small outcrop of ironstone and crystalline limestone, and drives put in. Average samples from ferruginous material and manganic iron in the veins gave each a trace of gold.

MOUNT CRAIG.—An Adelaide exploring and prospecting syndicate reported in July, 1897, striking a 2ft. reef in this locality which carried good gold.

MOUNT DUTTON RANGE.—In June, 1889, the Government Geologist roughly prospected this locality, which lies some 12 or 15 miles N.W. of Algebuckina and higher up the Neales River. Encouraging prospects of alluvial gold were found in several places, and there is every reason to suppose that payable patches of auriferous ground exist and might be found by diligent prospecting. The areas occupied by the Mount Dutton, Peake, and Mount Denison Ranges, extending from near Anna Creek to Mount Dutton, a distance of about 80 miles, are surrounded by Mesozoic plains, with a great thickness of sandstones, shales, and other deposits covering the bedrock. Prospecting for gold should commence on or near the outcrops, and once a lead or run of gold is struck it is possible that it may be traced far out beneath the Mesozoic deposits of the plains.

MOUNT GRAINGER.—Situated about 9 miles N. of Oodla Wirra. In December, 1894, the then Inspector of Mines reported in detail, the sum of his statements being that at about 150ft. above the creek a long open cut had passed through a rubble formation 30ft. wide, with quartz stringers showing gold occasionally, whilst decomposed material prospected over 2ozs. of gold per ton. Jaspers honeycombed quartz was abundant; also yielding excellent prospects. A strong well-defined quartz reef exists, carrying gold; strike, N.E. and S.W. The gold was free, coarse, and easily saved; and 5dwts. per ton should pay. The results from 20 washings showed from 1oz. to 6ozs. per ton. A subsequent inspector reported that doubtless there would be a compact lode found at depth. Samples taken by him from the workings varied from 2dwts. to 3ozs. 14dwts. of gold per ton, and 3ozs. 2dwts. of silver per ton. In March, 1895, he found that the underlie shaft had been continued to 53ft., and a drive put in 20ft. from that level, with a winze thence 45ft.; lode still in unsettled country; prospects good. The Government Geologist examined the property in 1895, and stated that the rich formation is composed of hard and soft sandstone, quartzite, clayslate, and argillaceous sandstone, with calcareous sandstone grit and quartzite in the neighborhood. The gold-bearing veins together make an irregular lode formation 3ft. to 4ft. in width, apparently due to the intrusion of veins or dykes of igneous rock into sandstone and clayslate, in the fissures of which rocks ferruginous material has been deposited. The formation resembles those occurring near Mount Pleasant. Good prospects of fine gold are to be obtained by washing the vein-stuff from any of the excavations on the mine. Some of the stone treated at the Government Cyanide Works gave these results:—Stone, 4 tons 6cwts., treated by battery, 5ozs. 3dwts. 9grs., valued at £3 18s. per ounce; by cyanide, 15dwts. 14grs., valued at £4 per ounce.

Report by Inspector Matthews, in May, 1900. Up to then the principal work had been confined to block No. 296, which is in the Mount Grainger Range, and stands about 120ft. above the plain level. The lode outcrop can be traced through the full length of the block, and in each end of the adjoining leases, being, in places, over 20ft. wide, composed chiefly of friable ferruginous lode material, the enclosing rock being principally slate of the usual gold-bearing character, and is probably in the same mineral belt of country that extends on to Teetulpa, from whence large quantities of gold were formerly obtained. The workings consist of several cross trenches, underlie shaft, vertical shaft, winze, and drives, the surface trenches exposing in each instance lode material, and proving its course to be N.E. and S.W., with a W. underlie. About 30ft. from the hilltop an open trench has disclosed the lode for fully 20ft. in width, and the prospects tried all contained gold to a greater or less extent, many of them being very good indeed. From this point a very irregular underlie shaft and small workings have been carried down to the depth of 75ft., some of the drives being across the formation, others on its course, but in no particular instance to any great extent. About 100ft. S.W. of the underlie a main vertical shaft has been sunk to the depth of 150ft., and connected with the former. At this point the lode has been crosscut, showing the formation to be from 25ft. to 28ft. in width, composed chiefly of siliceous gritty kaolin, with small veins and seams of ironstone, in places crossing from wall to wall; drives have also been made a short distance on the course of the lode. In the S. drive, 20ft. S. of the shaft, a winze has been carried down a further depth of 70ft., making a total depth of 220ft. on the underlie, or 200ft. vertical from the surface. Here the lode formation appears of greater width than at the 150ft. level, but the character of the material has somewhat changed, containing boulders and blocks of intrusive rock, with small quartz and iron seams running through the joints, in which gold can be frequently seen, portions being very rich. Doubtless as the works are continued to a greater depth the intrusive rock will again disappear, leaving the ore body as it appears at the 150ft. level. From all parts of the underground workings described there have recently been treated at the Petersburg Government Cyanide Works 398 tons of ore, which yielded 175ozs. 10dwts. of gold, or an average

of 8dwts. 20grs. per ton, which can only be regarded as very satisfactory. Further vigorous working of this property is fully warranted by its present appearances and past returns. There are other parallel formations which should be prospected; having up to the present received little or no attention, their size or value has not yet been ascertained. (I.M.R., 1-5-00.)

Reporting further, in December, 1900, the inspector states that the work of developing the property is proceeding satisfactorily. A winding engine, with appliances, has been erected, and the main shaft sunk and timbered to a depth of 220ft. Chambers have been opened and crosscuts driven at the 120ft. and 220ft. levels, the latter being about 300ft. below the site of the old shaft on the hilltop, and at this level the crosscut has been made for 35ft., passing through 30ft. of lode matter, consisting of ferruginous kaolinised slate material, containing seams, veins, and bunches of ironstone, running in various directions, some of them prospecting equal to the upper workings. At the 120ft. level the crosscut has been extended 40ft., and in about 60ft. more will probably intersect the lode. A most promising formation, 7ft. thick, was passed through about 10ft. from the shaft; it is very similar to the material of the main lode, but containing less iron, and gives good prospects. All work has been done in a very creditable and workman-like style. (I.M.R., 8-12-00.)

In March, 1901, the inspector again reports that the work of development is proceeding satisfactorily, and that the levels and crosscuts in various parts of the mine prove the lode formation to be over 20ft. wide, and of a nature as previously described. The crosscut at the 120ft. level has passed through the formation, which at this point is 28ft. in width. A drive has been made N., and by means of a rise is connected with the upper workings, from the old shaft. From bulk samples of the day's hauling, the satisfactory average of 11dwts. gold per ton was obtained. It is intended to continue the main shaft, to obtain a supply of water for milling purposes. (I.M.R., 5-3-01.)

The total quantity of ore treated at the Petersburg Cyanide Works was 520 tons 8cwts., which yielded 219ozs. 19dwts. 6grs. of gold, valued at £862 19s. 7d., the average yield being worth 33s. per ton. A battery was afterwards erected at the mine, and in September, 1901, started crushing, 250 tons being crushed for 31ozs. of gold. Some time afterwards the mine was worked on tribute, and 500 tons crushed returned 3dwts. per ton.

MOUNT MONSTER.—Blackfellow's Creek, Mount Magnificent, on the E. side of a fairly continuous line of steep rugged ranges, of an auriferous character, rising to a considerable height on the W. side of Blackfellow's Creek. In the S. lease there are two surface openings and one shaft, the latter sunk to a depth of 26ft. These workings have exposed, for the length of about 200ft., a lode formation, composed of ferruginous quartz of a most favorable character, being impregnated with iron more or less throughout, more pronounced, and the material being more friable on the hanging-wall side; the strike of the lode is N. and S., with a W. underlie of 2 in 6. The No. 1, or S., opening is a surface trench cut through the lode outcrop, which shows for about 18ft. in width, but sufficient depth to show well-defined walls have not been attained. On the W. side a portion of the lode body, 2ft. 6in. wide, was more friable and iron-stained than the balance. No. 1, midway between the openings, has been sunk to a depth of 26ft. on the W. or hanging-wall side. At the bottom the lode has a much better appearance than near the surface, there being a larger number of ironstone veins, in which, apparently, the gold chiefly occurs. The wall exposed is fairly good; in places bands of ironstone break through, but will probably not continue far into the enclosing slate and sandstone rocks. The second cutting is simply a surface opening, not of sufficient depth to expose the full width of the lode, which at this point is, to a large extent, overlaid with alluvial. On the W. side a vein of quartz, iron, and clay, from 6in. to 2ft., was met with. A parcel of 6 tons taken from this place, and treated at the Mount Torrens Government Cyanide Works, gave 12dwts. 12grs. of gold per ton. In the N. lease a small

opening has been made to the depth of 12ft. or 15ft. on the footwall side of the lode formation, exposing a vein of quartz from 6in. to 8in. wide, containing a little iron, but not of the same character as that shown in the other workings. From its position the inspector was inclined to think it a parallel lode formation, but until a series of cross-trenches have been made the point cannot be determined. This should be done, as the lode is apparently very large, and a shaft sunk at the most favorable point. Should these operations be successful, there is a good site for a tunnel at the foot of the hill. Samples taken gave the following results:—

No. 1, or S. opening	trace of gold
No. 1 shaft, bottom, two samples iron-stained quartz...	"
No. 1 shaft, end of shaft, 2ft. from bottom, containing large percentage of iron.....	4ozs. 14dwts.
No. 1 shaft, opposite end, containing large percentage of iron	10ozs. 9dwts.
Second opening, vein 12in. wide, containing large percentage of iron.....	1oz. 3dwts.
Third opening, N. block.....	nil

These clearly show that at present the better class ore is associated with the iron bands. The results from the shaft and the second opening are encouraging; the reef, so far as exposed, is strong, and likely to continue, with good prospects, and work of development is fully warranted. (I.M.R., 8-1-00.)

A tunnel has been driven from the foot of the range for 240ft.; the E. wall of the lode was cut at 218ft., and the W. wall has not yet been reached, as the remaining 22ft. of the tunnel is in lode material; the face shows country rock, with small quartz seams. The lode material is of a siliceous nature, and portions contain iron and pyrites in considerable quantity, and of character favorable for gold-bearing. The size of the lode body cannot yet be determined, but it is evidently large, and appears permanent. At this point it is probably of low grade in bulk, but from indications in the upper workings, it is probable that by driving S. along the course of the lode much more valuable ore will be encountered. The shaft is now 60ft. deep; it has followed the lode, which consists chiefly of iron-stained quartz, containing a little pyrites, with occasional open vughs, or cavities, filled with soft gritty kaolinised matter, rich in gold. A sample taken from one of these at 50ft. deep gave 9ozs. 16dwts. gold per ton, and two samples of quartz taken from the shaft bottom returned 1oz. 6dwts., and traces respectively, showing that the high and low grade materials are closely associated, making it most difficult to obtain a correct average value, except by actual battery and cyanide treatment of separate parcels from the different localities. It is advised that the shaft and tunnel should be connected, in order that the trend and value of the ore bodies could be examined. The inspector considers the prospects to be encouraging. (I.M.R., 17-7-02.)

The total quantity treated at the Mount Torrens Cyanide Works was 47 tons 6cwts., which returned 15ozs. 15dwts. 19grs. of gold, valued at £57 2s. 1d., the average yield being worth 24s. per ton.

In 1904, the shoot of gold-bearing stone having been lost, it was determined to test the ground at depth, and the use of the Government diamond drill was obtained. The lode was bored through at various depths from 300ft. to 600ft., and proved to be 9ft. thick. Unfortunately the gold contents, where passed through by the drill, were small, and the company went into liquidation.

MARIA.—Situated $2\frac{1}{2}$ miles S.E. of Taltabooka Well. Auriferous quartz was discovered on the surface in 1894. The Inspector of Mines reported that some costeaning pits showed a fair amount of auriferous stone. Samples from these and from heaps on the surface assayed 2ozs. 6dwts. of gold and 1oz. 12dwts. of silver per ton. There is no defined lode, but the property is worthy of development. (1895.)

MOUNT KINTORE.—Locality, $1\frac{1}{2}$ miles N.W. from the Alma. Two peaks on a hill form a centre towards which six distinct reefs of white barren-looking quartz strike. The Inspector of Mines stated that the whole hill is a mass of hungry-looking quartz, not likely to carry payable gold. Samples tried by the Government Assayer gave no valuable result. Little work had been done on the claim at the time of his visit. (1889.)

MOUNT MAGNIFICENT.—Gold was found on section 209, hundred of Myponga, near the River Finniss, and 2 miles in a W.N.W. direction from Mount Magnificent. At a spot 20 chains E. of the river, and 150ft. up the slope of the hill, a large quartz reef crops out. A tunnel has been driven into the hill about 10ft. below the reef to a lode formation from 2ft. to 3ft. in thickness, and from which quartz was excavated for about 16ft. The reef strikes N. and S., with an underlie of 45° E. N. and S. of the tunnel it bends round in the shape of a horseshoe. The quartz generally is very ferruginous. Good prospects of rough gold were obtained from stone taken from the tunnel and the outcrop; no fine particles were found. The reef is large and well defined. This is the prospectors' claim. On Mincham's claim a tunnel of about 75ft. was driven along a small reef higher up the hill to the S.E., having a S.E. underlie, and composed of white and ferruginous quartz. No gold was to be seen in the quartz. An attempt was made by a small company to work these reefs, but the claim was abandoned before much work had been done, and before any payable results had been obtained. Subsequently shafts were put down and tunnels driven, but no valuable discovery made. The Inspector of Mines stated that the mine was situated in an auriferous belt of country. The long tunnel had been driven 275ft. (1889.) Prospecting for reefs should be encouraged in this vicinity.

Vide also Little Gem, Golden Nob, Golden Rock, Nicholas' Lease, and Mount Monster.

MOUNT OGILVIE.—Locality, $3\frac{1}{2}$ miles S.S.E. from Tower Gap, Mount Lyndhurst Run. Gold was found to occur in small veins of ferricalcite and quartz, traversing siliceous and calcareous slates. Rich specimens of gold were obtained from these veins, associated with ores of cobalt, nickel, and arsenic, in which the gold was sometimes found embedded. The Inspector of Mines reported that there is a continuous run of broken hills and low-lying ranges from Gill's Bluff to Nichol's Nob. a distance of 10 miles, capped by beds of concretionary slates, in places ferruginous, and besides there are masses of siliceous and cherty slates. Gold was visible in the barytes, and the compact ullmanite nearest the barytes was remarkably rich in gold. There was no trace of copper 2ft. below the surface, though the outcrop contained carbonate of copper. (1889.)

The work done soon after the discovery seemed to prove that the gold-carrying veins are not persistent in depth here.

MOUNT OGILVIE WEST.—Locality, S.W. of and adjoining Mount Ogilvie Mine. Two shafts were sunk, No. 1, 42ft. vertical, passing through nine leaders containing quartz, calcspar, and iron, carrying a little gold; and No. 2, sunk on the underlie of a lode at an angle of 50° to a depth of 64ft. The width of the lode on surface increased to not less than 20ft. at the depth mentioned, where it consists of iron, calcspar, quartz, oxide of manganese, and earthy iron gossan. A picked parcel of 11cwts. of this treated in the Huntington mill yielded 1oz. 9dwts., being at the rate of 3ozs. to the ton, and assays have been had as high as 22ozs. gold and 118ozs. of silver. A small lot of 1cwt., treated by Harrold Bros., yielded $4\frac{1}{2}$ per cent. nickel and $\frac{1}{2}$ per cent. bismuth, with traces of cobalt. Two other reefs on the property have not been tested. (1890.)

MOUNT RUFUS.—Locality, sections 149 and 150, hundred of Dutton, 17 miles N.E. from Kapunda. The Inspector of Mines reported in January, 1895, that on the saddle of a high hill there is a strong body of quartz, 3ft. wide, enclosed by decomposed granite stained with iron; samples gave no return of gold. A vein of

quartz on the crown of the hill assayed a trace of gold. There are other shallow sinkings exposing veins which gave no results, but these veins are of a kindly nature and auriferous. They should be tested at depth.

MOUNT VENTURE is on section 4107, Onkaparinga. In January, 1887, gold was found on the cap of a reef, which strikes nearly due N. and S., with an underlie E. and traceable on the surface for some distance. A shaft was sunk to a depth of 63ft., and at 31ft. a crosscut put in. This showed the reef to be 18ft. wide. Assays taken yielded gold at the rate of 2½ozs. to the ton. At 63ft. drives were extended N. and S. along the reef, which consists of ironstone, with veins of quartz. The existence of a defined and continuous shoot of gold was not proved. (1889.)

MOUNT VICTORIA MINE is about 2 miles S.W. from Mount Victoria, in the N.E. district. Prospecting for copper ore was carried to a depth of about 60ft. The lode contains specular iron, carbonates, red oxide, and sulphides of copper, and iron pyrites. The lode strikes N.W., and is about 2ft. wide, in a soft decomposed granitic dyke. Gold occurs in the green carbonate, the quartz, and the iron oxide, in coarse and fine specks. The lode is worth testing for gold to a depth much greater than that reached. (1883.)

The Inspector of Mines, in March, 1900, reports that from time to time a considerable amount of work has been done in the way of sinking shafts and driving on a fairly well-defined lode, striking N.W., from which very rich gold and copper specimens have been obtained. The principal shaft in the old workings has been sunk to a depth of 70ft. on the underlie, and a drive made S. for 104ft. In consequence of water and debris remaining in the workings, they could not be thoroughly examined, but, judging from small portions left in the upper levels, the lode formation is from 3ft. to 4ft. wide, containing veins of good-grade ore. The inspector was informed that the previous company had sent away 35 tons of ore, which gave a return of 2ozs. of gold and 15 per cent. of copper per ton. From the same workings the present owners had raised a few tons, then on the dressing floors, which contained a fair percentage of copper, and free gold could be seen associated with the iron. For some time operations had been confined to the sinking of a main vertical shaft, situated 80ft. S.W. of the old workings, to the depth of 90ft.; from the bottom a crosscut was in progress, through very hard granite; 19ft. had been done, leaving 15ft. or 20ft. more to reach the supposed position of the lode. At 70ft. from the surface, in the shaft, 8ft. of broken country was passed through, containing small veins of copper and iron gossan, and should the bottom crosscut not prove satisfactory, it would be advisable to crosscut at this level, as the small veins would probably lead to a larger ore body. Samples taken gave the following results:—

From 90ft. shaft, 70ft. from surface	30½ % copper
From surface opening, 50ft. E. of 90ft. shaft	trace
Bulk sample from dressed ore, 80ft. N. of 90ft. shaft.....	19 % copper, 1oz. 5dwts. gold.

These results may be regarded as satisfactory, and warrant the continuance of operations. (I.M.R., 15-3-00.)

MULDOON'S CLAIM.—Situated at Angipena. The Government Geologist examined this property in April, 1896, and found a shaft down 30ft. on a large "blow" of brown iron ore, siliceous iron, and gossan, up to 15ft. wide, and pyrites. Four average samples returned, in two cases, a trace of gold, and in the others nil.

MYPONGA.—In May, 1886, the Government equipped a party of 18 men to prospect for gold in the hundred of Myponga. They began on section 287, Meadows Creek, near its junction with the Finnis, and in a line of shafts, varying in depth from 5ft. to 17ft., put across the creek, gold was found, but not in payable quantities. The E. slope was tried within 100yds. of the creek, and a fair prospect was found in 4ft. sinking. In one shaft a small patch yielded about 1oz. 10dwts. of rough gold. Around this shaft a great number of others were sunk to depths of from 4ft. to 30ft.,

but no payable gold was found. A little distance below the junction of the Finnis and Meadows creeks some holes were put down to depths of 11ft. and 14ft., but greater depths could not be reached owing to the influx of water. Some specks of gold were met with in the drift. Four hundred yards below this point a line of shafts was thrown across the river, and two distinct runs of gold were struck. Near Mount Compass shafts were sunk from 3ft. to 40ft. deep, and gold was found in nearly all. In the 40ft. shaft it was found at 17ft., on a false bottom. From that depth the sinking was through sand cement on to a granite bottom. Other trial shafts were put down in the neighborhood of Mount Compass, without result. Holes were also sunk down the river to about 300yds. below the junction of Black-fellow's Creek. Specks of gold were found in most of the holes. Returning to their starting point on the Meadows Creek, and prospecting N., the party obtained signs of gold in nearly every gully, but not in payable quantities. In Cooper's Gully a good prospect of shotty gold was got, but operations were greatly retarded by the large quantity of water met with. At Lantern Flat, about $1\frac{1}{2}$ miles N. of the starting point, the party prospected places where two long gullies come into it. Some of the dirt yielded from 2dwts. to 3dwts. of gold per load. Prospecting operations were not carried beyond this point. (1887.)

At a spot directly on the boundary of Myponga and Kuitpo a few yards square of surfacing was prospected for gold. A trial washing yielded four or five specks. By making a race from the Finnis River a short distance above this point, sluicing could be engaged in during several months of the year. (1889.)

MOONLIGHT.—This claim adjoined the Lady Franklin Mine, Port Lincoln district. Six shafts have been sunk, from 20ft. to 37ft. in depth. The reef is well defined, and was reported to be auriferous. (July, 1897.)

NANTAWARRA.—Locality, old Nantawarra Dam. In a conglomerate ironstone deposit, in the bed of a dry creek on Johnson's land, it was reported in October, 1895, that traces of gold had been found.

NACKARA REWARD.—Situated about 6 miles E. of the Nackara Railway Station, on the Hog Back Range, a strong line of ranges running N. and S., and in places rising more than 300ft. above the level of the plain. On the hilltop there is a strong quartzite outcrop, striking in the same direction as the main ridge, underlying slightly to the E., and containing small veins, seams, and leaders of quartz; these are irregular, have no general strike, and occasionally show coarse specks of gold. The outcrop has been broken in places, but has not been sunk upon. On the E. side of the range, which rises very abruptly to the height of about 400ft., a tunnel has been driven for 171ft., and should be, when extended, fully 150ft. below the highest point of the outcrop. The rock driven through is chiefly sandstone and quartzite of an extremely hard nature. Small seams of quartz were found, including one of fair size, in which it was stated a little gold had been found. At the end of the tunnel the rock is not quite so hard, and contains a little pyrites, probably owing to the face of the tunnel nearing the outcropping body; and considering the amount of work done, the inspector advises that the tunnel should be continued until the formation is struck; this may be expected within another 60ft., and the ground would then be thoroughly tested. From the surface openings and breakings of the outcrop 8 tons of material, treated at the Government battery, Petersburg, gave 5dwts. per ton. (I.M.R., 15-8-01.)

On a further inspection it was found that the tunnel had been extended 81ft., making, with the approach, a total length of 252ft. The inspector was satisfied that the veins mentioned are the lode continuation, and it would be of no advantage to drive the tunnel any further. Future development work in the lower levels should be preceded by surface prospecting by a series of open cuts across the line of lode at the most favorable points, and the prospects then gained would guide future operations. Samples taken from the veins passed through in the tunnel returned traces of gold. (I.M.R., 24-10-03.)

NOARLUNGA.—In 1894 an Adelaide syndicate worked a large reef containing sugary spar and iron pyrites, carrying a little gold. The assays were poor, though one was said to have reached 1oz. 3dwts. of gold and 5ozs. of silver per ton. It is distant about a mile from the Almunda Silver Mine.

NORTH NAIRNE.—Locality, near the Nairne Railway Station and nearly adjoining the New Banksia. The Inspector of Mines reported that there was a large reef upon the property, which required capital for thorough prospecting. From 3dwts. to 4dwts. per ton could be obtained by trial crushings all through the reef, which is 10ft. thick at the 140ft. level, but pinches going S. At the 80ft. the reef averages 5ft. It had been estimated that under effective treatment the reef would yield 1oz. per ton. The lease contained $\frac{1}{2}$ mile in length of reef, striking N. and S., with a dip E. at an angle of 10°. The drives opened and winzes sunk exposed fully 11,000 tons of material. Numerous assays obtained averaged 12dwts. per ton; and the gold was of high quality. Stopped working, wanting capital. (1890.)

NORTH PARA RIVER.—On section 586 a party of men tunnelling in the banks of this river, at the junction between the bedrock and the Tertiary drift, got washdrift consisting of cemented gravel and boulders, showing gold. The ground tried up to 1889 was not regarded as payable.

NICHOLAS LEASE.—This adjoins the Golden Nob, close to the Finnis River, in the vicinity of Blackfellow's Creek. Portions of the ground have from time to time been worked for alluvial, with, it is stated, very fair results. The present operations are confined to an opening 6ft. deep, exposing lode formation from 7ft. to 8ft. wide; composed principally of slate and promising looking veins of ironstone, from 4in. to 12in. thick. Prior to sinking shafts it would be advisable to further prospect on the line of lode by a system of open trenches and trial pits, by means of which shoots of gold may be discovered, and the proper position for sinking shafts for deeper development indicated. (I.M.R., 17-12-03.)

NILLINGHOO GOLDFIELD.—Situating near Mount Victor. The Government Geologist in 1895 described the mode of occurrence of gold here, remarking upon the peculiarities exhibited in the Kirkeek's Treasure Mine. The country rocks consist of quartzite, sandstone, siliceous slate, and clayslate, striking E. and W., and tilted up into an anticlinal arch. The lode strikes through these rocks in an E. and W. direction, penetrating the quartzite rock, which contains thin bands of kaolinised slate. The lode formation carries hematite, brown iron ore, and gossan, with quartz and kaolin intermingled with quartzite rock, and cavities are occasionally filled with brown clay containing crystals of limonite of all sizes, cubical and modified (evidently at one time pyrites), and crystals of quartz. The limonite has resulted from oxidation. (See "Kirkeek's Treasure.")

A number of claims were taken up in the neighborhood of Kirkeek's Treasure soon after its discovery. They were more or less prospected, with varying results, and finally abandoned. The names, as far as known, are—*Nillinghoo, Birthday, Nillinghoo Eastern, Nillinghoo Extended, Nillinghoo Gold Mining Company, Nillinghoo Lookout Hill, Nillinghoo Proprietary, and Nillinghoo Western Blocks.*

No alluvial gold finds have been reported from this locality.

NOR'-WEST PROSPECTING COMPANY.—This was formed at Hammond in December, 1894, to send out prospectors through the country lying between the settled districts and the W. boundary of the province. A party was formed, and Government assistance obtained, but results were not satisfactory.

ONE TREE HILL.—Locality, Shillabeer's section. Prospecting commenced in 1896 on a reef traceable along a ridge, and it was stated that two samples assayed respectively 2ozs. 11dwts. 16grs. and 5ozs. per ton of ore. A syndicate secured a mining right over four sections. A later report stated that a tunnel had been driven 211ft., and a lode 2ft. wide, and numerous leaders had been prospected. Open cuts had been excavated, and a shaft sunk 40ft.

OUTALPA MINE (Carson's—later called the "Golden Dewdrop").—Situating about $1\frac{1}{2}$ miles N.W. of Outalpa railway siding. Workings consist of two vertical shafts;

111ft. apart, 60ft. and 25ft. deep, surface costeans, and two inclined drives along the course of the lode. One of these starts at a point 130ft. N. 56° E. from the 60ft. shaft, and has been driven S.W. along the course of the lode, slanting downwards, connecting with the 25ft. shaft at 17ft. from the surface; the other starts in same surface workings, 175ft. from the deeper shaft, and goes down in a similar manner under the first drive to a point S.W. from the 25ft. shaft. The deep shaft has been sunk on the footwall side of the lode, and is connected with the inclined drive by a short crosscut at the bottom, where water has been met with. The workings have been made on a lode consisting of ferruginous quartz and gossan, which, at water-level, is replaced by pyrites and a little quartz. It varies in thickness from 3in. to 20in., strikes N. 65° E., and underlies steeply to the N.W.; it is irregular, and has no defined walls. Sixty-six tons 12cwts. of ore treated at Petersburg Government Cyanide Works returned 42ozs. 12dwts. 16grs. of gold. (4-12-01.)

PARA WIRRA, HUNDRED OF.

Notes on the Gumeracha and Mount Crawford Goldfields. (10-1-86.)

The area comprises most of the E. portion of the hundred of Para Wirra, with a few sections in the N. of the hundred of Talunga. It is bounded on the N. by the South Para River, and on the S. and E. by the range of hills which form the water-parting between the Torrens and the Para River basins, and on the W. by the private property in the valley of Malcolm's Creek.

There are two distinct tracts of country divided by Murray Vale—that to the E. is a large tableland, about 1,000ft. above sea-level, consisting of flats and swamps, with low hills, generally covered with dense honeysuckle scrub and grass trees; whilst that to the W. is very rough, being a series of steep timbered ranges, with gullies running in deep channels, and frequently passing through gorges and over waterfalls.

The highest hill (1,400ft.), at the head of Sailor's Gully, is a peak in the N. and S. range, which is the continuation of the range from Mount Gould. To the W. of this hill are several rough steep spurs, but none attain anything near the height of this hill.

The range that forms the boundary between the hundreds of Para Wirra, Talunga, and South Rhine is very low along the S. boundary until it nears the S.E. corner, where it attains its greatest height at Gillmore's Hill (1,300ft.), after which it gradually decreases in height to the N. Mount Crawford is on the N. bank of the South Para River, and is 1,358ft. above sea-level; it is an isolated hill, and very steep on the N. side, where the gorge of the Para River separates it from the little mount (1,200ft.), which is at the N. end of a ridge that runs N. and S. between Murray Vale and the large flats to the E.

The South Para River drains the whole of this area, and is always running below Mount Crawford, where it flows through a series of steep rocky gorges, sometimes 200ft. sheer down. There are few defined creeks to the E., and they spread out into large swampy flats and waterholes; they never run except after continuous heavy rain in the winter, but they store large quantities of water, which gradually finds its way through the sand into the river during the summer months; this, in a large measure, accounts for the constant flow of the river. The creeks to the W. run generally in steep rocky channels, but are interspersed here and there with small grassy flats; like the creeks to the E., they never run except after heavy rain.

Geology.—In this, as in the other goldfields, we find comparatively new Tertiaries lying directly on the old Palæozoic and Metamorphic rocks, which latter are here greatly broken and altered by numerous granite dykes.

Newer Gold Drifts.—The most recent formations here are the sand, clay, loam, and gravel of the gullies; of these, the sand is far the most abundant, particularly in the E. portion; altogether, they have nowhere proved to be of any great thickness.

Small Cappings and Patches (Surfacing).—Between the boundaries of the older gold drift capping (made hills) and the newer drifts of the flats the surface is generally strewn with debris of the former, often in such quantities that it is quite impossible to trace the boundaries of either; but the reefs and masses of rock which protrude in places intervening show that these drifts cannot be thick.

The Older Gold Drifts (Made Hills and Cappings) are ferruginous conglomerates, sandstone, claystone (cement), sand, clay, gravel, &c.

These rocks cover a large area of this district, particularly in the E. portion, where they form all the low hills, and flank the range on the S.E.

This formation appears to be the remains of what was a lake bed in Tertiary times; levels, carefully taken, show that there was no outlet low enough to drain the central part until the present river gorge cut its way through.

The lake probably overflowed at the low saddle, towards Springton, and was fed by various tributaries, portions of the beds of which are still left, one of which comes down from the Blumberg cemetery; there are also two others, coming from a S.W. direction.

Bedrock.—Here, as in the other goldfields, we have called the bedrock Lower Silurian, although, as in the other cases, no fossils are found which can determine its age.

The rocks are micaceous, chloritic and clayslates, with beds of quartzite and schistose sandstone, with numerous quartz reefs; these are well exposed in the range on the S.E. and E. boundaries, and are apparently much broken and faulted, as great variation of strike is found, even in following them for a short distance.

There are three large beds of quartzose sandstone—one in the S.W. corner (S. of Dead Horse Gully), one forming the main range from the Gumeracha Diggings to the Para River, and one the range of which Little Mount Crawford is the highest peak.

The highly metamorphic rocks consist almost entirely of mica schist, with beds of quartzite, sandstone, and gneissic rock, with a general N.E. dip, intersected by numerous quartz reefs and granite dykes. These rocks occupy the whole of the N.W. corner of the area, from the Gumeracha Road to the Williamstown Road, and in it the goldfield is situated.

Dykes, Veins, &c.—The most prevalent strike of the dykes and veins is nearly N. and S., but there appears also to have been a second dislocation nearly at right angles to the first one, and at a later period, which formed the E. and W. lodes and dykes. A peculiarity of the veins is that they are often a mixture of solid white quartz and granite, with sometimes a predominance of one and sometimes of the other, so intermixed that they must either have been formed at the same time, or the granite, on cooling, must have left large cavities, probably filled with steam or gases, into which the silica subsequently found its way, in solution.

The granites are of a large crystalline character, often containing crystals of tourmaline; in a dyke on the N. side of the river, in Mr. Warren's property, beryls replace the tourmaline.

The quartz reefs mostly contain a large quantity of iron in the form of pyrites, from which it is most probable that the gold is derived.

There is an opal reef a little N. of Hannaford's reef, and another to the N. of Sailor's Gully. Up to the present time no precious opal has been found in them, but they would be worth prospecting. There is also a vein of serpentine, which follows the same course as the opal, near Sailor's Gully. This may, in future, be of some value for carving; and it is in these veins that meerschaum occurs, although none has been found here yet.

Gumeracha Goldfield.—This goldfield was discovered by Watts and his mates about the beginning of 1884, and worked quietly for about a year; but somehow, at the beginning of 1885, it got wind that they were getting a good deal of gold.

This started a few out to try it, and they published such glowing accounts of their prospects that the place was quickly rushed, and the original prospectors, from having the whole country, were confined to the ordinary sized claims, and these not the best; however, they applied for and received from the Government £200 reward for the discovery of a new payable goldfield. Watts' Gully is a small gully on section No. 111, discharging itself into Dead Horse Gully. Here the first gold was found, and it was by far the richest gully on the field; it was very rich to a little way above the fork near the top, and particularly rich just at it, where some large nuggets were obtained, which, as far as can be gathered, were not taken from the deepest gutter, but rather upon the W. bank. Lately, some nice cemented nuggets were obtained on the opposite side, on a low point behind the blacksmith's shop; these had been so little rolled that they could not have travelled far from the reef. The specimens on this side differ considerably from those on the other side, which were generally largely intermixed with ironstone. There was also a small steep gully on the W. side, just below where the heavy gold was found, that was very rich. The other alluvial workings were all found shortly after Watts', but were none of them more than patchy, and, taking them altogether, cannot be called payable diggings.

Adelaide Syndicate.—These claims join Hutchinson's on the W. side, and follow down Watts' Gully, taking both banks, and some way up the hills on either side. Of these the N. is the only one on which much work has been done; on this the first shaft is just on the E. bank of the gully; it was sunk just into the solid ground when a drive was put under the gully, with the idea of cutting any reef that might carry gold. The drive ought to have been carried on further, also in an opposite direction. It would have been better if the work had been done higher up the gully, so as to be nearer to where the heavy gold was found. The next shaft was over 80ft., sunk on the top of the hill by the side of Hutchinson's shaft, with the idea of cutting his reef at its junction with a well-defined reef, a little W. of the shaft, and dipping in an E. direction. These reefs have evidently pinched, as nothing but two very small leaders were cut in the shaft.

Aladdin, section 275, is situated near the Tieca, higher up the same branch, on the E. side. Here a shaft was sunk 50ft. or 60ft. in slate, with a drive on a reef at the bottom, from which good prospects are said to have been obtained.

Avenue Gully.—On the W. side of this gully are three or four old shafts. One is about 50ft. deep, and has been timbered, but the timbers have become rotten and unsafe. There are two reefs, one solid white quartz and the other ferruginous quartz and gossan; they strike N. and S., and dip 70° or 80° W. The rock is mica schist.

Bismarck.—In Para Wirra very little has been done in prospecting deep leads; the only ones that have been worked are the Bismarck and a small patch near Mount Gawler.

The Bismarck is situated on the N. side of Devil's Gully, and the lead runs in a N. direction, crossing several other spurs and gullies; but only one carried any gold. The sinking was very hard, being mostly cement, and was never payable, although some small nuggets were found from 1dwt. to 1oz. in weight.

On the E. side of Mount Gawler some small patches of old gold drift were worked by a Government prospecting party under Mr. Goddard; but nothing payable was found.

Cambrian.—Situated in Watts' Gully, and worked in 1894 by an Adelaide syndicate. The old main shaft has been carried down to 102ft., and a drive was following the course of the lode N. and S. It was 6ft. wide, and consisted of ironstone, quartz, gossan, and pyrites. The prospectors stated that good assays had been obtained.

Challoner.—Besides costeaning, a shaft was sunk 25ft. (1896), at which depth the prospectors put in a crosscut to open on two large lodes visible on the surface.

Excelsior adjoins the Aladdin, at the head of the same gully, and the stone from a large hole on the cap of the reef is said to have yielded 8dwts. to the ton. There are two shafts, each 70ft. or 80ft. deep, connected by a level at the bottom, sunk in a soft decomposed slate which, near the bottom, becomes blue and very hard. Some small ironstone leaders were cut in the S. shaft. The quartz is very barren looking, with often a good deal of mica in it.

Easter.—Watts' Gully. The Inspector of Mines (September, 1894) states that in a costean the reef showed 2ft. 6in. wide, with walls of micaceous schist. An underlie shaft was down 37ft., apparently under the footwall of the lode. A vertical shaft, 65ft. deep, has a small leader and had cut a little water. A 60ft. vertical shaft had been sunk on the E. lode, which it reached at 45ft., and a drive was put in at the 60ft. level, when the lode was again opened upon. The lode is auriferous, but has not been properly tested.

Gumeracha Syndicate.—This claim is situated across Watts' Gully, just by the fork, and covers all the ground where the heaviest alluvial gold was found. A tunnel on the E. bank of Watts Gully, just above the fork, has been driven 86ft. through mica schist dipping to the E. Several large blows of quartz have been opened on the surface, but though the tunnel has passed close under them there was no sign of a reef in the ground passed through until the reef was struck at 86ft., though several small veins and segregated masses were struck. There is also a shaft sunk to a depth of 60ft. in mica schist up the E. branch gully; no reef of any size was struck, but two small leaders containing mundic were passed through. This claim might be cheaply tested by trenching from the low point just below the fork, on the E. side (where the blacksmith's shop stood), a little above where the heavy gold was found, to the W. side of the creek, and about 20yds. up that bank, testing everything like a veinstone.

The Gumeracha Gold Venture.—Situated S. side of Dead Horse Gully, between Avenue and Snake gullies. It was found by Wallace, on Christmas, 1885. The reef strikes N. 20° W., and dips W. nearly vertically; it is as much as 6ft. wide in places from wall to wall, but is not solid. There are two shafts—the N. one is sunk 43ft. on the reef, but as it was unsafe another to the S. was put down 37ft., and, being to the E. of the reef, it has not struck it; but a small leader was met with at 15ft., from which prospects are said to have been obtained.

The rock here is mica schist, striking N. and S., dipping E. 50°, and is very hard. Rich prospects are said to have been obtained from this reef, specimens showing loose gold in the stone. The intention was to sink 60ft., and drive to the reef to get out a crushing, but work was suspended. There is a large influx of water in both shafts.

Hannaford's Reef.—Section 130. A large reef running N.E. and dipping W. A series of shafts were put down close together along the whole length of the outcrop, besides numerous pits and trenches. It is stated that a large number of very rich specimens were obtained here, but there is no record of any bulk treatment. Later, in 1896, a shaft was sunk 45ft. on the underlie of the reef.

Hutchinson's Claim.—This claim is situated on a low ridge between Watts' and Snake gullies, just below the fork in Watts' Gully. There is a small reef striking S.W. and N.E., dipping W., containing mundic, and from which some fair prospects were obtained at the surface. A shaft was sunk, and at 15ft. went through the reef; sinking was continued to 40ft. in the hope that the reef would turn and dip in an E. direction.

Hamlin Mine is on the same line as the Lady Alice and the Try Again Mines, but is on private property, sections 3271 and 3272. A network of leaders was met with, too poor to work. Two or three shafts were sunk to the N., but no payable quartz found. The Inspector of Mines reported an examination on February 28th, 1891. He stated that in 1876 a shaft was put down 100ft., with a view of

working the Lady Alice lode; another was put down 70ft. to cut the Queen lode, and a little work was done on the New Year's Eve lode. Another shaft N. of the old workings has a well-defined lode 5ft. wide in the bottom, which gave an assay return of 1dwt. of gold per ton. In the opinion of the inspector that shaft should be sunk a further depth of 100ft. and drives put in N. and S., and the old Hamlin shaft should be utilised for further exploration.

Hamlin's Gully was rich just below the Lady Alice reef, where the gold was large and rough—the largest nugget found being 3ozs. in weight. This gully had two or three other payable patches on the private property. On July 31st, 1871, the Warden of Goldfields estimated that £2,000 worth of gold had been obtained from it.

Goddard's, on the same line, has a shaft 160ft. deep. A drive was put through slaty granite and gneissic rock to the reef, but no gold was found.

Kapunda Syndicate.—Locality, Watts' Gully. The property consisted of some claims taken up on the W. side of the gully, near the fork, for the purpose of finding the vein from which the gold was supposed to have been derived. Fossicking amongst the quartz "blows" was unsuccessful, and a tunnel was then put into the hill for a distance of 137ft., at a spot about half-way down from the ridge. The rock passed through was mica schist and segregations of quartz dipping to the E., but no reef was found. Operations were suspended. The Kapunda Syndicate had other claims at the head of Blood and Thunder Gully. A shaft was sunk and various cuttings made, but no reef found.

The Lady Alice Mine is situated in Hamlin's Gully, just above the private property. The main reef strikes about N. 10° E., and underlies to the E.; but it is either split by a "horse" or crossed by a smaller reef which underlies to the N.E., and carried the rich stone both in gold and copper; the latter in the form of sulphides, oxides, and native copper. On the N. side of the gully, where the gold was first discovered, is the only place where the spur reef comes to the surface; this reef was passed through at 30ft., when the deep vertical shaft was sunk, but the sinking was continued to 160ft., striking the main reef at 100ft. There were two levels put in from the shaft to the junction of the reefs at 50ft. and 100ft., and the reef was also driven on at the 160ft. level. A rise was carried up 400ft. on the spur reef to a point on the hill a little to the S.E. of the main shaft, from which the mine was subsequently worked. The upper part of the small reef has all been stoped; in fact, one of the last mine managers worked up so close to the surface that the dam, which was then over the mine, broke into it, filling it with water. In working this mine the managers who at different times had charge of it, not knowing the country, devoted most of their time to working the main reef, which was very poor in gold, except at the junction, whilst the tributers worked on the spur reef on payable stone.

The mine is now full of water to within 14ft. of the surface, or rather above the level of the creek, into which it flows as a spring; but, from all accounts, this could be easily kept under by the 6in. pumps now in the shaft, should anyone desire to reopen the mine, and follow down the shoot of gold and copper below the 160ft. level. It was discovered in 1871 by G. Goddard, who, with three others, sunk a shaft 40ft., and obtained some very rich quartz. The water being very strong, a company was formed and machinery erected, including a 20-head battery. The company failing to make the mine pay, it was taken on tribute by G. Goddard and others, who worked it at a profit for six months. The company again carried on operations, but failed to do so at a profit. For the last six months of 1874, during which time the mine was worked on tribute by Goddard and party, 1,149ozs. 19dwts. 21grs. of gold were obtained. The value of the copper procured at the same time, cost of smelting and carriage deducted, was £208 2s. 8d. From the floating of the company in 1873 to its winding-up in 1879 the value of gold raised was £22,000, and of copper £4,000. In the neighborhood the bedrock has a general strike of N. and S. It consists of gneissic granite, felspathic schist, quartzose, and micaceous and hornblendic schist, yellow felspathic rock with quartz in rounded pieces—

probably a decomposed elvan dyke, greenish hornblendic rocks and granite veins indicating the presence of greenstone and granite dykes below, to which the great metamorphism the rocks here have undergone is due. Gneissic granite is the prevailing rock. (1885.)

About £7,000 was spent on this mine, and the Government subsidised the work done. It was stated by the manager (1888) that a new discovery of gold had been made in a drive going towards the junction of the main with the spur reef, and that the copper bagged showed at least 20zs. of gold to the ton. The Inspector of Mines states that there are two reefs, the main one going N. and S.; that the ground is totally untried in depth, and that the upper levels yielded ore of value. Mr. Scarfe, the secretary, reported (1890) the then owners were sinking vertical shaft 250ft.; driving crosscut W. to reef 90ft., and driving along its course with the idea of picking up the junction of the spur with the main reef at 250ft. from the surface in new ground. The Inspector of Mines reported in November, 1890, that the vertical shaft had been sunk to a depth of 250ft., and at 240ft. a level was driven which holed into the old workings. A drive 400ft. N. on the course of the lode proved that up to that date it had not been payable. He recommended sinking the shaft to 350ft., and a drive along the course of the lode to prove its character; and that the application for a further subsidy should be granted. In June, 1898, was exhibited a button of gold 40zs. 14dwts. 22grs., resulting from a crushing of 4 tons 14cwts. 1qr. and 24lbs. of stone obtained from near the surface. In May, 1904, a new reef was discovered a short distance from the old workings, and 13 tons sent to the Petersburg Cyanide Works returned 420zs. 8dwts. 14grs. of gold, valued at £168 14s. 2d., a yield per ton of 30zs. 5dwts. 6grs. of gold, equivalent to 259s. per ton.

The Lady Edith is to the S. of the Lady Alice, on the main line of reef. The shaft was sunk 260ft. through very hard granitoid and gneissic rock, but the reef did not carry a payable amount of gold.

Mary's Gully.—Here a large number of holes were sunk, but nothing payable was found.

There were two or three other places, as Vixen's Gully, Devil's Gully, and at the diggings on the E. side of Mount Gawler, where small quantities of gold have been found.

Philip's United.—Situated at the head of Watts' Gully, Gumeracha; was opened January 1st, 1886. There are two shafts, with several costeans and pits. The first shaft was sunk on a reef dipping to the W.; the reef was cut at 14ft. from the surface, and was found to be from 12in. to 18in. wide. The shaft was subsequently sunk to 52ft., and a 26ft. drive put in at the bottom, but without result. No. 2 shaft was sunk lower down the hill and cut a reef 2ft. from the surface; at 13ft. a second reef was struck of a width of from 3ft. to 4ft., and striking S.W. and N.E. 50°. At 37ft. a floor was cut, striking N. and S., dipping W. 50°. (1887.)

In this claim the rock (which is mica schist) as well as the reefs dip in the opposite direction to anything else in the neighborhood.

Para Wirra Prospecting Syndicate.—The area held comprises sections 3274-77-78, and 80, adjoining the South Para River. The Government Geologist reported in March, 1896, that he had inspected some shallow shafts and excavations here. A 15ft. shaft exposed a small vein of quartz and ironstone, striking N.E.; no gold visible, but the reef widens at the bottom, where water-level is reached. A barytes vein 2in. to 6in. thick contains iron ore and gossan stained with carbonate of copper. There are dykes of granite and quartz which have not been opened up, and other veins and outcrops were noted. There is a well-defined reef near the top of the spur, consisting of quartz, ironstone, and sandstone, striking N.N.E., and dipping 70° S.S.W. The property lies between the Lady Alice and adjoining auriferous reefs and the Barossa diggings, and consequently is in a good position for prospecting for reef and alluvial gold.

Queen Victoria Extended.—Situated near the Young Australian. It was reported in June, 1896, that prospecting operations were being carried on, and that in one excavation there was a lode fully 4ft. wide, carrying fine gold. An underlie shaft had also been put down 35ft., and showed a 2ft. 6in. lode that was widening as it went down.

Royal Blackbird.—Situated in Watts' Gully. Shaft sunk 50ft., crosscut 30ft. Several leaders exposed. Assays up to 12dwts.

Smithfield.—Another mine on the Lady Alice line of country. Worked without success.

Tieca is at the head of the Lady Alice, in the N. branch of the gully. No reef visible, but a drive was put into the hill for 200ft. or 300ft., and a shaft was sunk in the gully to a depth of 70ft. in the slate rock. No reef cut.

Try Again Mine is on the N. side of the creek, and is on a continuation of the Lady Alice reef. At this point it splits into a network of leaders, three of which are the principal ones. In 1871 G. Davy and others found a rich patch of surfacing, beneath which were gold-bearing leaders. These were followed down to a depth of 40ft., when copper ore was met with, associated with gold. A company was formed, winding and crushing machinery was erected, and a shaft was sunk 250ft. Several small leaders were struck by crosscuts from the shaft, one of which, a foot in thickness, contained copper ore and gold. (1885.)

In November, 1897, it was stated that there was at 50ft. a lode 2ft. wide, consisting of quartz, ironstone, and pyrites. The gold could be seen in the stone, and £3 19s. 6d. per ounce was obtained for the smelted gold resulting from the last parcel treated. In March, 1898, the shaft was down to 78ft., close timbered, and a crushing in July returned 10dwts. 19grs. per ton.

The Young Australian is an amalgamation of four claims on the private property just below the Lady Alice, and between Hamlin's and Wild Dog gullies. There are three principal parallel reefs; the one nearest the Lady Alice Mine, called the *Young Queen*, was opened up about 1871 by two shafts about 20ft. deep, and a cutting in very hard slaty rock; but, though good prospects were obtained, the work was discontinued. It strikes first N. 10° E., then N.W. A report was made in January, 1897, that prospectors had struck auriferous stone 9in. thick at a depth of 8ft., and that at 14ft. the stone was 2ft. thick and still carrying gold. In Mitchell's underlie shaft at 25ft. the stone was showing gold freely.

The next, called the *New Year's Eve*, was discovered by Messrs. Moule and Downes, who sunk a shaft about 20ft. in a yellow slate. Very good prospects and specimens were obtained from this reef, which in places has veins containing much fine gold. The reef is no great size. A trial crushing at Woodside is said to have given 12dwts. to 16dwts. per ton.

Young Australia No. 1 has been worked from a cutting and a shaft, 30ft. or 40ft., in Hamlin's Creek. The reef is large, being from 4ft. to 5ft. in width, and well defined. It contains manganese, copper (native), copper pyrites, galena, barytes, calcite, carbonate of iron, and iron pyrites. It was very rich on the hanging-wall, and, as a rule, contained coarse gold, which sometimes might almost be called nuggets. There are several other small shafts, the deepest of which is 26ft. Some time ago 40 tons were crushed at the Lady Alice battery, but the result was not made public. The rock is an altered sandy clayslate, dipping 45° E.

Young Australian No. 2 joins the New Year's Eve claim to the N., and takes in the flat of Wild Dog Gully, where a good deal of alluvial gold was got. Here there has been a large hole sunk on a network of leaders of ferruginous quartz, which were very rich in gold. One piece, which was nearly all gold, weighed 16dwts.; and as much as 1oz. 3dwts. was got in one prospect in a mortar. A shaft was sunk 44ft. to cut the reef in settled ground, where it is large, glassy, and crystalline, and often much iron-stained, and carries no gold.

Young Australian No. 3 is situated to the N. of No. 1 claim. It has been worked on a large reef 16ft. wide, by a large excavation to a depth of 20ft. A crushing of 5 tons went 12dwts. to the ton.

Mr. F. C. Singleton stated that £1,400 worth of alluvial gold was found in the sections comprising the Young Australian property.

Watts' Gully.—Situate on section 111, hundred of Para Wirra, was discovered in 1884, and was the centre of operations. It was remarkable for the number of nuggets found, some of which were of considerable weight. One purchased by the Government weighed 14ozs. 8dwts. The total amount of gold obtained is not known, but may be estimated at not less than 1,000ozs. In addition to Watts', several other gullies were opened up N. for a distance of two or three miles. (1887.)

The foregoing information, and also that concerning Barossa, has been mainly extracted from the reports of the Government Geologist, 1885, and the Assistant Government Geologist (H. P. Woodward), 1886—Parliamentary Papers of November 24th, and December 10th, 1885, and June 22nd, 1886. These papers are accompanied by interesting detail geological maps of the districts referred to.

Ludlow.—This property is located about 2 miles W. from Kersbrook, and 4 miles from Chain of Ponds, in the hundred of Para Wirra. The lode croppings can be traced for some considerable distance, striking about N.E., with an E. underlie. At various points there have been small surface openings, exposing lode matter, and one tunnel driven on the course of the ore channel 80ft., disclosing lode formation within the enclosing walls from 8ft. to 9ft. wide, the principal portion being decomposed sandstone, with bunches of gritty kaolinised matter containing veins of strongly iron-stained quartz, ranging from 2in. to 6in. wide. At times the vein matter has increased to 18in., and then again contracting to the size mentioned, which is one of the characteristics of lode formations of this description. Seven samples taken from the workings and ore dumps gave the following results:—No. 1, face of drive, vein 6in. thick, 2dwts. of gold per ton; No. 2, face of drive, vein 4in. thick, 2dwts.; No. 3, bottom of drive, vein 2in. thick, 2dwts.; No. 4, bulk sample, ore dump, 5dwts.; No. 5, ore dump, containing pyrites, 4dwts., copper 3 per cent.; No. 6 ore dump, trace; No. 7, ore dump, 3dwts. It will be seen from the above results of the assay returns that the gold contents, taken in bulk, are of rather low value. The present workings are confined to shallow depths, where the country rock is very much broken and disturbed. Probably at the deeper levels the vein matter may become more consolidated and of a more uniform character, and the gold contents of higher value. To test this point it would be the better plan to sink a prospecting shaft on the E. side, with the object of intersecting the lode at the depth of at least 60ft. or 70ft. from the surface. (I.M.R., 14-9-07.)

PARALANA MINE, Mount Fitton, 2 miles N.E. of the Hamilton Mine. The work consists of four shafts, the deepest being 100ft., and a drive at the 90ft. level. The lode, upon which the shaft has been sunk for the full depth, varies from 18in. to 3ft. in width; the upper portion, to the depth of about 30ft., is composed of ferruginous quartz, containing gold and copper; a sample taken from this part assayed 1oz. 8dwts. of gold, and $4\frac{1}{2}$ per cent. of copper per ton. Driving has been started at the 90ft. level, where the lode had pinched to 18in., and is more siliceous, containing less iron; a sample from this place only gave a trace of gold, and $\frac{3}{4}$ per cent. of copper, showing that the shaft had passed through the rich shoot of ore, which doubtless dips either to the N. or S., and will probably be met with, of similar value, at the lower level. From the surface to 90ft. the lode is well defined, with two good walls, on a slight underlie, and though it may pinch in places, it will probably make again to its usual size and value. About 3 chains S. another shaft has been sunk to a depth of 26ft. on a copper vein, supposed to be a parallel lode to the main one, but sufficient work had not been done to determine this; it is 3ft. wide, and should be further prospected by sinking. There are other veins and formations on the property worthy of prospecting. (I.M.R., 2-8-99.)

For later working see "BRINDANA," page 37.

PIMPONDA.—Situated about 1 mile W. of Old Boolcoomata Station. The Inspector of Mines stated that the country is made rugged by intrusive granite, and there are large dioritic dykes traversing it and the clayslate. A reef in No. 1 shaft is composed of quartz and copper ore, and specks of gold can be discerned; and in No. 2 shaft good prospects of gold are obtainable from an iron and copper branch varying from 8in. to 18in. in thickness. Gold was not found until sinking reached a depth of 25ft. The outcrop of reef is well defined, and continues for 2 miles. After a later visit the Inspector reported that, in the hill shaft, at a depth of 61ft. a strong body of quartz had been exposed, and that a parcel of the stone tried gave the return of 1½ozs. to the ton. (1889.)

PIONEER.—Situated about $\frac{1}{2}$ a mile from the township of Callington. In the early days unsuccessful prospecting shafts were sunk for copper on the W. boundary of the property; these disclosed near the surface siliceous formations containing fine gold; and recently the work done by trial pits and cross trenches has not been sufficient to properly define the width and value of the gold-bearing material. The present workings (April, 1902) are about 200yds. E. from the W. prospectings, and on a separate line. A prospecting shaft has been sunk to the depth of 60ft., and a winze 27ft. deeper, disclosing a vein of ironstone gossan 2ft. wide, on each side of which there is gold-bearing material about 2ft. in width, making the formation in places fully 6ft. wide. The outer portion of the footwall side consists chiefly of gritty kaolinised sandstone, and on the hanging-wall ferruginous schist, each containing fine gold, which, in places, can be seen in the planes and joints, doubtless leached from the central gossan vein and deposited in the enclosing rock, which is friable, with fine gritty seams of siliceous matter throughout. Within a few feet of the winze bottom a small drive has been made S.W. on the course of the vein for 15ft., and also one at the 56ft. level for 55ft. N.E., the vein in each place being as already described. Eighty tons treated at the Mount Torrens Government Cyanide Works gave a return of nearly 8dwts. per ton. The gold is fine, but of specially good quality, the last parcel being worth £4 2s. 3d. per ounce. The prospects are favorable, and the property should be developed in a systematic manner by sinking a working shaft some short distance S.W. of the present one and extending drives on the ore body both N. and S. Underlie prospecting shafts should also be sunk at various points on the line of lode, and connected with drives. The correct width, quantity, and value of the formation would then be determined, and also the question of erection of plant for local treatment. Two samples from open surface trenches W. workings assayed 1dwt. and 3dwts. gold per ton respectively. Four samples taken from the present workings gave returns:—

Centre of lode, ferruginous claystone	1dwt.
" " "	1dwt.
Kaolinised material, footwall side of lode	2ozs. 15dwts
Ferruginous schist, hanging-wall side	3dwts.

PUTT'S WELL.

The Government Geologist reported on the auriferous reefs near Putt's Well in 1888:—These reefs are situated about $1\frac{1}{2}$ miles N. of Putt's Well, near Oonatra Creek, on the Boolcoomata run. Claims were taken up for about 1,000yds. along the line of reef in an E. and W. direction. At the W. end Messrs. Crozier & Sheppard held six claims. There are small veins of quartz and gossan, with calcareous and argillaceous material stained green with carbonate of copper, varying in width from an inch or two to a foot. The bedrock consists of felsite, containing both mica and hornblende, evidently a metamorphic rock which has been altered by the intrusion of eruptive granite dykes. From another shaft about 30ft. deep,

where there are two small perpendicular veins in similar rock, a crushing of 4 tons is said to have been raised and sent to Woodside. These veins are small, and composed of quartz, iron oxide, and gossan. The bedrocks are schistose, gneissic, feldspathic, and micaceous rocks, with eruptive dykes of granite. Sullivan, Mathews, and Legge's claims come next. Sufficient work has not been done to prove anything here, the shallow holes which have been sunk having exposed only thin copper-stained veins of quartz and gossan of an irregular and uncertain nature. For the next 1,400ft. there is no reef showing, the ground being chiefly occupied by coarse eruptive granite, which appears to have cut out the reefs. At that distance there is a siliceous reef in micaceous sandstone and slate with granite veins; also 700ft. further on there is a still larger outcrop of similar rock close to the granite boundary. Both appear likely to contain gold. Walsh and Legge's claims are the last on the line where any appreciable work has been done. Two shafts were sunk about 14ft. each. There is a large vein formation here, and besides the gossan and other iron oxide, some rich copper ore was obtained. E. of these claims the eruptive granite takes the place of the metamorphic rocks. I found it difficult to discover any gold in the veinstone from these claims except by crushing and washing, although I have been shown moderately rich specimens of auriferous quartz by reliable persons which had been obtained there. So far as the veins had been followed they are small and irregular, but more prospecting is required before it would be safe to say that larger and richer veins do not exist in the locality. The general rock formation of the country is gneissic granite, mica schist, micaceous slate, and sandstone, with eruptive dykes, and bosses of granite. The latter rock is, in the neighborhood of the reefs, much mixed up and intruded into the metamorphic rocks in which the auriferous veins occur, so that the latter may be expected to be irregular and uncertain. It is advisable, however, that the veins should be sunk on to greater depths and more fully prospected, and that the siliceous reef outcrops in the neighborhood should be tested. The following assays of rough averages from the veinstone raised and lying near the shafts were made by the Government Assayer:—

Crozier & Sheppard's Claims.—No. 1, quartz and gossan, gold, 2dwts. 16grs. per ton. No. 2, quartz and gossan, gold, 6dwts. 13grs. per ton. No. 3, quartz, gold, 2dwts. 16grs.

Legge & Walsh's Claims.—No. 1, quartz and gossan, gold, 1dwt. 2grs. per ton. No. 2, quartz and gossan, gold, 2dwts. 14grs. to the ton.

There is a good supply of drinking water at Putt's Well. The ranges here are steep and high, and the gullies consequently narrow and well defined, and easily tested for alluvial gold; its presence is probable.

RAVENSBURG.—The Inspector of Mines reported that this mine is situated about $1\frac{1}{2}$ miles from Hahndorf, in the hundred of Onkaparinga. A few holes had been sunk on an ironstone formation, which is about 3ft. wide, and which is apparently a true fissure vein, bearing N. 10° E. and underlying W. The ground is in an auriferous belt of country, and possibly the ironstone may carry gold in depth. (1890.)

RISCHBEITH'S WELL.—During 1888 gold was discovered at Rischbeith's Well, about 40 miles S.W. of Hergott Springs. The rocks consist of inclined and twisted limestones, sandstone, and slate beds, intersected with quartz and iron oxide veins. Alluvial gold and fine specimens of gold in oxide of iron were found, but no payable results were reported.

ROCKY RIVER.—Locality, 8 miles W. from Gladstone. It was alleged that gold and silver were found in a lode formation, but the Government Geologist reported that there was no lode, but simply small irregular outcrops of ferruginous claystone and iron ore in a bedding of clayslate, limestone, quartz, sandstone, &c., which strike N. and S. and dip slightly to the E. The country rocks are not favorable to the occurrence of gold, but any defined lode or reef found may reasonably be prospected. The surface and gullies in the vicinity of the find should be tested with a dish.

ROYAL CHARLIE.—Situating about 7 miles S.E. from Teetulpa. The workings consist of an underlie shaft sunk to a depth of 180ft. and a vertical shaft 62ft. deep connected with the underlie shaft. At 180ft. a drive was put in for 25ft. or 30ft. along the reef 5ft. wide; strike N. and S. The veinstone consists of quartz and other siliceous material, brown iron ore, gossan, and pyrites. The country rocks are clay and calcareous slates and sandstone. Besides the main reef there are two cross veins striking E. and W. and S.S.E. respectively. Though the main reef is short, yet, owing to its great thickness, it has yielded a large quantity of crushing stuff. Assays of stone have given—(1) quartz, ironstone, and pyrites, gold 4dwts. lgr. per ton; (2) ditto, rough average from a heap, gold 8dwts. 2grs. per ton; (3) ditto, ditto, gold 1oz. per ton; (4) ironstone, gold 2ozs., silver 13dwts. per ton; (5) ditto, gold 33ozs. 12dwts., and silver 10ozs. 2dwts. per ton; (6) ironstone and quartz, gold 15ozs. 13dwts. per ton. As the gold is not visible in the stone before washing, it is impossible to judge what proportion of lode stuff is of the richness indicated by the assays. The Inspector of Mines reported later assays of samples of blanketings and tailings yielding respectively 1oz. and 3dwts. per ton; and subsequently that he had got as high as 4ozs. per ton, and also that he had obtained an assay of 1oz. 5dwts. from the tailings pit. (1889.) It is stated that 10 tons of auriferous stone were sent to England with a view of showing the character of the reefs. A 50-ton parcel yielded 3dwts. to the ton only, but it was stated that three or four times that quantity of gold was left in the tailings, it being what was called "float" gold. A sample treated by Mr. Cosmo Newbery gave a return of 6dwts. per ton.

ROYSTON ROBERTS' LEASES.—These were situated adjoining Lambert's Mine, at Paratoo, about 8 miles from Nackara Railway Station. The Inspector of Mines examined this property, and reported that there was a main shaft 84ft. deep on the underlie, and at the 35ft. level a drive E. 51ft. 9in. was put in to cut the lode, which dips at an angle of 1 in 3. Another shaft had been sunk 56ft. near the S. boundary of the claim. There are several other lodes on the leases, and all of them are irregular in width, in places pinching down to a few inches, but in other parts expanding to a width of 4ft. or 5ft. Very high results were obtained from some samples assayed. Official returns received by the Mines Department state that on lease 161, at the end of 1898, the deepest shaft was 98ft., and a new shaft had been sunk on the boundary 82ft., and there was another 66ft. deep, besides several small shafts. The country was unsettled, but a rich leader existed on the footwall of the lode. On lease 569 the deepest shaft was 120ft. Unsuccessful efforts were made to raise more capital.

SCOTCHMAN.—Situating near Ironclad Gully, Teetulpa. First worked soon after the discovery of Teetulpa, when several shafts, from 20ft. to 115ft. deep, were sunk. Lately the ground was taken up by Hooper & Son, who have raised stone from the surface down to a depth of 25ft. The lode is from 4in. to 15in. wide, with a slight underlie and very fair walls. It is composed of ferruginous quartz; bunches of dense pyrites ore occur at from 25ft. to 30ft., and will probably become more frequent at deeper levels. A sample from the trenches gave 17dwts. per ton. Two samples from No. 2 ore dump returned 11dwts. and 6dwts. respectively, and one taken from No. 1 ore dump gave 2dwts. per ton. Considering the size of the vein and the difficulty in having the ore treated, the average of the returns is rather low; but the fact of there having been so much alluvial gold obtained in the vicinity warrants the assumption that rich shoots of ore in the vein formations will eventually be discovered, should the work of development be continued. (I.M.R., 1-12-02.)

SCHUBERT'S SECTION, known as PARSON'S FIND.—Hundred of Onkaparinga, about 2 miles N.E. from Woodside. Inspected in July, 1904. A series of open trenches and trial pits from 3ft. to 12ft. deep extend for about 80yds. in length, and a shaft has been sunk to the depth of 40ft. These workings have disclosed vein matter from 6in. to 15in. wide, principally composed of quartz, limestone, and gossan of an auriferous character, striking about N.E. and S.W., with an under-

lie of 2 in 6. Six samples taken at different points assayed gold per ton as follows :—Open trench, 12ft. deep, 7dwts. and 2dwts. ; coarse stone in ore dumps, 9dwts. ; fines from the same, 4dwts. ; ore from shaft 40ft., 8dwts. ; vein 60yds. N. of present workings, 1dwt.—showing clearly that the vein is gold-bearing for a considerable length. This, together with the auriferous nature of the enclosing rock, will warrant more vigorous development by at first sinking prospecting shafts on the vein to whatever depth the influx of water will permit. The country is mostly under cultivation and overlain with alluvial, and an inexpensive system of cross-trenching would probably prove other parallel veins to exist. Previous to the inspection 5½ tons treated at Mount Torrens gave 15dwts. per ton. (I.M.R., 6-7-04.)

Up to June 30th, 1907, 53 tons 16cwts. have been treated at Mount Torrens, yielding 25ozs. 15dwts. 9grs. of gold, valued at £87 13s. 2d., the average yield being worth 36s. per ton.

SEBASTOPOL.—Section 436, in the Waukaringa district. It has one shaft 100ft. deep, and was afterwards included in the Alma Extended.

SELLICK'S HILL.—Hundred of Willunga, 5 miles S. of the township of Aldinga. A reef on the surface was reported to contain gold. An adit about 30yds. in length was driven from a gully about 200ft. below, but as the reef was not met with the work was abandoned. (1887.)

SOUTH-EAST.—An alleged discovery of gold was announced in September, 1896, the locality being near *Marcollat*, in the Great Desert, about 40 miles from Kingston. The Government Geologist reported at the end of 1896 that he had examined several localities in the district, which were being prospected for gold, as follows :—(1) *Papineau Rock*, 5 miles S.S.E. from Avenue Range North Head Station, where there is an outcrop of felspar porphyry, surrounded by Tertiary deposits, the rock unusually dense and solid, without any trace of lode. (2) *Bin Bin Islands*, 4 miles N.E. from a deserted station, where an outcrop of felsite and felspar porphyry is backed on the W. side by blue metamorphic quartzite ; no lode visible, though the junction of the rocks is favorable to its existence. (3) *Gip Gip*, 4 miles N. from Marcollat, an outcrop of bluish metamorphic quartzite, with disseminated iron pyrites ; no appearance of lode. (4) *Didicoolum*, where there is an outcrop of rocks containing quartz veins and pyrites ; strike, N. and S. ; dip, vertical ; the country rocks favorable to the occurrence of gold and other metallic minerals. It was stated that native copper and tin had been found, but nothing to indicate the latter was observed. These outcrops are at long distances apart, and are surrounded by a thick deposit of Tertiary limestone, sand, clay, &c. The assays made from samples taken from these several places gave no trace of gold, silver, copper, or tin.

SECTION 5539, ONKAPARINGA.—Prospecting operations were, in 1897, carried on here at a bend of the River Torrens. The Government Geologist reported unfavorably as to the probability of finding auriferous deposits of value. Stone treated at Mount Torrens Cyanide Works gave an average of about 11grs. of gold per ton.

SHEPHERD'S.—Locality, section 98, Eurelia. There are here short quartz lodes, 2ft. to 3ft. wide in places, carrying iron ore and clay veins, traversing slate conglomerate rocks, which extensively outcrop. Gold is obtained in the clay seams, and is said to have been found in coarse specks in the quartz. Assays of four samples made—one gave 1dwt. per ton and the others traces only.

SOUTH KANAPPA.—The report of the Inspector of Mines, after an examination in 1894, was to the effect that on section 1870, Angas, several shafts had been sunk on irregular veins of ironstone and quartz, ill-defined, running through a hard syenite. He took samples from a heap of ironstone, the assay result of which was 11dwts. of gold per ton. From the N. end of the claims samples taken gave 5dwts. of gold per ton.

Seven tons 13cwts. 2qrs. treated at the Mount Torrens Cyanide Works returned 30zs. 7dwts. 11grs. of gold, valued at £13 2s. 6d., the average yield being worth 34s. per ton.

STARS AND STRIPES.—Situated about 1 mile N.W. from Mount Grainger. Worked by a shaft and an open cutting about 45ft. long, average depth 6ft. This discloses a quartz vein 6in. to 8in. wide, strongly associated with iron. The shaft has been sunk to a depth of 80ft. on the E. or underlie side of the vein, and seems to have passed through its continuation at a place where the vein is small, or pinched so much that it has not been noticed. There is a strong quartz vein in the bottom of the shaft, but the character of the stone is inferior to that in the open cutting, and the gold contents are poor. It would be advisable to sink a shaft from the most favorable point in the open cut, and follow the vein on the underlie, in order to prospect it thoroughly. There are several other openings and trial pits, exposing veins and small leaders carrying gold, which fully deserve a further trial. (I.M.R., 30-8-01.)

Twenty tons 3cwts. treated at the Petersburg Cyanide Works returned 5ozs. 18dwts. 10grs. of gold per ton, valued at £22 17s. 7d., the average yield being worth 22s. per ton.

TALTABOOKA.—In 1896 the late Mr. J. B. Austin sent 5cwts. of stone from each of three claims, from depths varying from 30ft. to 120ft., with no gold visible in the samples. The average return from the whole was reported as 2ozs. 2dwts. 15grs. of gold per ton, with 13ozs. 12dwts. of silver per ton.

The Adelaide and Suburban Prospecting Syndicate held a lease 2 miles E. from the well, which the Inspector of Mines reported upon in June, 1892. He said there were numerous segregated veins on the lease; general strike E., dip S. On one of these a shaft was down 75ft., and samples yielded 1oz. 1dwt. 5grs. of gold per ton. The N. ironstone vein-ore assayed 2ozs. 14dwts. 12grs. of gold per ton. There was fair reason for carrying on prospecting operations.

TEATREE GULLY.—Situated not far distant from Modbury. The Inspector of Mines reported that it contains an immense outcrop of ironstone, apparently striking N. and S., and traceable for 2 miles. In a large excavation, fully 100ft. in diameter and 30ft. deep, a shaft 150ft. deep had been sunk, showing a lode of compact ironstone the first 20ft.; it is then thrown out of the shaft to the W., and for 30ft. the shaft goes through sand drift, changing at that point into stone, which goes to the depth mentioned. A crosscut W. intersects the lode at 25ft. from the shaft, and at that depth it is found to consist of honeycombed quartz, oxide of iron, and a nice gossan, with stains of copper. The general appearance of the lode is favorable to the theory of it becoming charged with pyrites and gold-bearing in depth. The crosscut is in a highly mineralised strata, full of quartz stringers, showing pyrites and carbonate of copper, and this should be driven further, and the mine tested to water-level. (1890.)

TIPPIN'S.—Cuttlefish Bay, Kangaroo Island. It was worked in 1890, when the deepest shaft was 40ft., with a 22ft. crosscut, and a tunnel from the side of the hill 34ft. It was stated that 50 tons of stone yielded an average of 12dwts. per ton.

TRIUMPH.—Locality, Taltabooka, 1 mile S. from the Esmonde. The Inspector of Mines reported in 1895 that several shallow underlie shafts had been sunk on a well-defined lode, which strikes E. 30° S. Samples from the deepest shaft (18ft.) assayed 17dwts. of gold and 1oz. 9dwts. of silver per ton. The lode averaged 2ft. wide, and was composed of ferruginous quartz with small quantities of carbonate and sulphide of lead.

TALUNGA, HUNDRED OF.

A considerable quantity of gold has been found here on private and Crown lands, but our information in this, as in many other cases, is meagre and fragmentary. In the Adelaide Jubilee Exhibition of 1887 the finest specimens of gold in quartz exhibited came from this district.

Argosy Claim.—Situated at Blumberg, near the Dan O'Connell Claim. Shaft sinking and costeaning (October, 1896); lode not struck. Another claim taken on the South Australian Company's land; sinking hard and wet. (1897.)

Forty-nine tons 5cwts. 1qr. treated at the Mount Torrens Cyanide Works returned 5ozs. 5dwts. 6grs. of gold, valued at £20 4s. 2d., the average value of the ore being 8s. per ton.

Belcher and Gray's.—Locality, near Stony Creek. A lode 2ft. wide, striking N.E. and S.W., and dipping W.; shaft down 22ft. on ferruginous quartz carrying fine gold. (1894.)

Black Snake Mine (also known as *The Great Talunga*).—Locality, section 127. The ground was taken up because some good specimens were found along the outcrop of the reef. Some of the stone crushed was said to have yielded well. The reef runs E. 30° N., dipping W. Two timbered shafts were put down, and cut the reef at 60ft.; they were connected by a drive, and one shaft was sunk 30ft. deeper. An engine shaft was sunk 50ft. and timbered, and some shallower shafts were put down. This mine was being worked in conjunction with the German Reef in 1887. The Inspector of Mines reported upon it in 1894 and 1895. He stated that a strong well-defined lode traverses the section E. 25° N., averaging 4ft. in width from surface to the 100ft. level, and was enclosed in mica schist. The stone under foot in the W. level he estimated at 17dwts. of gold per ton of ore, and as being richer than the ore got from the stopes.

In 1894 a parcel of 369 tons 4cwts. 3qrs. was treated at the Mount Torrens Cyanide Works, which returned 225ozs. 7dwts. 15grs. of gold, valued at £834 0s. 1d., being a yield per ton of 12dwts. 5grs., equivalent to 45s. per ton.

An English company, with an announced working capital of £25,000, took this property in 1896, and it was reported in March that some prospecting shafts had been sunk and good stone obtained. In the following August it was stated that capital ore was being got from a lode 3ft. wide.

In the latter end of 1896 a 10-head battery was erected by the company on the mine. In January, 1897, 30 tons of ore per diem were being treated; main shaft down 210ft.; at that depth they were driving E. and W. on a lode between 5ft. and 6ft. wide, and 40 men were working on the mine; but the result of the crushing was very low, and on the 24th April the mine was shut down after expending £5,000.

It is asserted by old miners in this district that there are still payable shoots of ore in the mine.

Blackler's Reward.—Locality, near Blumberg. In August, 1896, it was reported that a lode of ferruginous quartz, 5ft. wide, with good walls, had been struck, proved to be auriferous. A shallow shaft, a drive E., and costeans constituted the bulk of the work done.

Blumberg Gold Mines (also known as *Hynes' Reef*).—Section 6396. In August, 1896, the Government Geologist reported upon this property, stating that shafts had been sunk here upon two lines of auriferous reef, about 120ft. apart, the auriferous material consisting of ferruginous, argillaceous, and quartzose vein stuff, and sometimes quartz mixed with clay and kaolinised country rock. The W. reef varies in width from 1in. to 2ft., and in places branches into two or three veins; strike N.E. and S.W., dip N.W. at an angle of from 40° to 55°. The country rock is soft argillaceous sandstone and slate, with quartzite and sandstone bands. The E. reef is of a similar character, but more quartz is visible. The deepest shaft was 70ft., the last 35ft. being on the underlie. Good prospects were obtained by washing the vein stuff, and rich specimens of fine and coarse crystalline gold had been won.

Inspector Matthews reports :—There are several auriferous veins running through the property, the general strike being N.E. and S.W.; the country rock is an easily worked, soft, friable sandstone. What is known as No. 1 reef consists of ferruginous quartz, varying from 6in. to 2ft. thick, and occasionally mixed with clay and country rock; it has been worked from the 60ft. level to the surface. Towards the N. end of the property a main shaft 9ft. by 4ft., timbered and made secure, has been sunk to a depth of 130ft.; at this point the reef was intersected, and driving commenced, when operations were suspended without giving it the

trial it deserved. A tunnel has been driven through the hill a distance of 850ft.; this could not be examined, but it was stated that four gold-bearing veins had been struck, varying from 2in. to 3ft. in width. At 300ft. a large formation was encountered, which gave assay results of 7dwts. per ton. The tunnel needs repairs to place it in working condition. At that time (29-9-99), the mine was being worked on tribute, with satisfactory results. The inspector expressed his opinion that the prospects of the mine warranted its being worked in an energetic manner. (I.M.R., 29-9-99.)

In October, 1896, 12½ tons treated at the Mount Torrens Cyanide Works gave a return of 2ozs. 10dwts. per ton. In July, 1897, 40tons 19cwts. returned 1oz. 19dwts. per ton. In December, 1897, 100 tons returned 1oz. 4dwts. per ton. In February, 1899, 20 tons returned 1oz. 11dwts. per ton. In July, 1899, 20 tons 10cwts. returned 1oz. 10dwts. per ton. In January, 1900, 10 tons returned 7ozs. 8dwts. per ton. In January, 1905, some prospectors bagged and sent in for treatment 107 tons from the old mullock dump, which, although giving a low return, viz., 2½dwts. per ton, paid for crushing and carting. The total quantity of ore treated at the Government works was 699 tons 12cwts., returning 600ozs. 7dwts. 22grs. of gold, valued at £2,257 8s. 4d., the average extraction being worth 61s. per ton; a large quantity of gold was also obtained by dollying, of which there is no record.

Blumberg Proprietary (also known as *Smüh's Proprietary*).—Property held, 55 acres, on Mr. Peake's land. At the 30ft. level a drive was (August, 1896) put in S.W. 15ft., cutting a strong lode of quartz and ironstone, 2ft. 6in. wide, showing gold. Another shaft was commenced, designed also to cut the lode. In May, 1897, it was announced that a small company had been formed to develop the property. The Inspector of Mines, in December, 1900, reports that the work is confined to a ferruginous quartz formation, containing bunches of pyrites; it strikes N.E., averages from 2ft. to 2ft. 6in. in width, with fairly well-defined walls, with a regular W. underlie; and has been proved for over 200yds. in length, by a number of shafts, from a few feet to 100ft. in depth. At this depth (100ft.) soakage water is met with, which can be easily kept under during the summer months. Work was in progress at the 50ft. level, where the vein is about 2ft. 6in. thick, and appears to be widening in depth. The country rock is slate, sandstone, and decomposed granite. There are smaller formations on each side, similar in character, and containing gold, but very little prospecting has been done on them. On the W. side of the reef alluvial gold was formerly obtained, doubtless shed from the gold-bearing formation. (I.M.R., 7-12-00.)

Four hundred and eighty-one tons 2cwts. treated at the Mount Torrens Battery and Cyanide Works returned 213ozs. 6dwts. 4grs. of gold, valued at £769 17s. 4d., the average value being worth 32s. per ton.

Burton's.—Situated on section 6247. A shaft is down 70ft. on a reef of micaceous iron and quartz, with gold. There is also a cellular silico-feldspathic dyke, from which a quantity of ore was raised. The best stone was picked and crushed, yielding 14dwts. of gold per ton. A parcel of the discarded stone was sent to Mount Torrens Cyanide Works in 1894; and 49 tons 5cwts. 3qrs. treated yielded 1dwt. 6grs. per ton, which proved the dump to be unpayable.

Blumberg United, section 6572, was being worked in February, 1886. Shafts were sunk on several veins and reefs and some surfacing done. It was reported that 70ozs. were obtained in a five-acre patch of alluvial. (1889.) Same reef as *Blumberg Proprietary*.

Blumberg Diggings.—Another rich patch of alluvial diggings was situated near the *Blumberg Cemetery*. A deep lead formerly crossed the low saddle in these hills, of which a considerable portion still remains in the form of cappings; whilst, on the low ground, the bedrock is covered by the surfacing, which has proved very rich, and is evidently derived from the denudation of the old lead; but on this latter no attempt has been made, except close to the cemetery.

Considering the richness of this surfacing, this lead should pay to work, and from its elevated position would be perfectly dry. The alluvium of the creeks also goes to prove the richness of this lead, as colors can be obtained throughout the whole depth of the sinking, accompanied with cement pebbles derived from the older gold drift, proving its origin.

The great richness of Scott's and Hynes' properties, on the adjoining sections, prove this to be, without doubt, a rich auriferous district; and if experienced diggers prospected this deep ground some good results might be expected. (Assistant Government Geologist, 10-1-86.)

Central Brown Snake.—This mine is one of the Blumberg claims. A report published May, 25th 1895, stated that a shaft was being sunk to get under the lode, which was believed to be a continuation of the German Reef. In the drive the lode was 4ft. wide, with smooth solid walls. Stone was said to be showing gold freely.

Cobra.—Situated about 1 mile N. of Great Talunga Mine, on Crown lands. Seven tons 3cwts. treated at Mount Torrens Battery and Cyanide Works returned 1oz. 5dwts. 14grs. gold, valued at £5 6s., the average yield being worth 14s. per ton.

Confidence.—In November, 1894, after considerable expenditure for labor and machinery, the auriferous ore, consisting of iron, quartz, and pyrites, was found not payable, and work was suspended.

Crown Mine (also known as *Garden Gully* and *Elsie Brown*).—On section 6346, about $3\frac{1}{2}$ miles from Blumberg. From time to time prospecting at shallow levels has been done on various vein formations striking about N. and S., with W. underlie. At the time of the inspector's visit he found that an underlie shaft had been sunk 90ft., with drives on the course of the lode 50ft. N. and 20ft. S. The shaft shows from the surface to the bottom a ferruginous quartz vein, averaging about 1ft. wide, with a tendency to increase towards the bottom, the enclosing rock being favorable micaceous slate and sandstone. The drives show the vein from 12in. to 15in. wide, with fairly well-defined walls, with every appearance of permanency. Of three bulk samples tested, one gave 4dwts. gold per ton and two 5dwts. Sample of screened ore gave 8dwts. per ton. The inspector advises that the drives should be continued, in search of larger quantity and better quality of stone. (I.M.R., 4-12-01.)

This property has been worked intermittently for many years, and small parcels from time to time raised and treated at the Mount Torrens Battery and Cyanide Works, where 264 tons 1cwt. 3qrs. treated returned 130ozs. 7dwts. 22grs. of gold, valued at £466 8s., the average yield being worth 35s. per ton.

Dart's Syndicate (New Dart).—Locality of operations, Mount Torrens. It was stated in June, 1895, that good gold-bearing reefs were being prospected, one 2ft. wide, the other about 9in., striking N.E. and S.W., and very solid, dipping W. Highly favorable assay results are said to have been obtained. An auriferous reef has been found on an adjoining section held by the syndicate.

Sixty-four tons 14cwts. treated at the Mount Torrens Cyanide Works returned 19ozs. of gold, valued at £74, the average yield being worth 22s. per ton. A parcel of similar ore was also sent to the smelters, with slightly lower results.

Dan O'Connell.—On the top of a rise an E. and W. reef outcrops 12ft. wide. It was thought to be likely to prove payable. In September, 1896, a promising lode was reported as having been cut in a shaft 35ft. deep, besides some gold-bearing leaders. The reef pinched, and work was discontinued.

Seventeen tons 19cwts. treated at the Mount Torrens Battery and Cyanide Works returned 7ozs. 12dwts. 23grs., valued at £29 17s. 10d., the average yield being worth 33s. per ton.

Durdan is on section No. 6343, $1\frac{1}{2}$ mile E. of Blumberg. It contains one lode, bearing N. and S., dipping E., one in five, and varying in width from 10ft. to 14ft. The ore is auriferous quartz, occurring in patches, with fine gold distributed through the whole of the reef, and in some places in the surrounding country. The average yield to the ton was over 1oz. The auriferous veinstone consists of cellular

and solid quartz, penetrating a greenish serpentine granite, which has intruded into metamorphic sandstone and micaceous slates. One vertical shaft has been sunk to a depth of 100ft., and the water-level was reached at 90ft. The drives extend a distance of 90ft. What has been done upon this property is not sufficient to accurately test the real value of the lode. The Inspector of Mines, in 1889, said the mine had been worked in a primitive manner for many years, and capital was wanted for machinery.

During 1895 and 1896 this mine was occasionally worked, and 108 tons 11cwts. 2qrs. treated at the Mount Torrens Cyanide Works returned 54ozs. 16dwts. 19grs. of gold, valued at £206 11s. 1d., the average yield being worth 38s. per ton.

Duscomitche's Reef, also known as the *Vienna*. Section 6339. Some years ago rich specimens of gold were found in a quartz reef about 3ft. wide.

In June, 1907, two prospectors sent 14½ tons to the Mount Torrens Cyanide Works for treatment, which returned 6ozs. 0dwts. 8grs. of gold, valued at £20 6s. 9d., the average yield being worth 28s. per ton.

Elder's Section, No. 125.—Here a 40ft. shaft was put down at the junction of two reefs. One of these is about 2ft. wide, well defined; strike S.W. and N.E., dipping N.W. 45°; the other is a solid white quartz reef, striking S.E. and N.W.

Eldridge & Trinder's Reef.—Situated in Ruddaway's section, about 1½ miles from the Mount Torrens Battery. It was reported that an E. and W. ironstone and quartz reef was struck, 2ft. wide, well defined, and carrying some gold.

Flagstaff.—A small vein was struck in an old underlie shaft, and at 63ft. it was found to be 2ft. wide, and was still making. It contained ironstone, quartz, and pyrites, and it was stated yielded fine gold when crushed. (August, 1896.) The deepest shaft was reported in 1897 to be 90ft. on the underlie, and it was stated that two others were being sunk. There was a drive along the lode 12ft., and a crosscut 25ft.

Ten tons 2cwts. treated at the Mount Torrens Battery and Cyanide Works returned 3ozs. 16dwts. 9grs. of gold, valued at £14 2s. 8d., the average yield being worth 28s. per ton.

German Reef Mine.—Situated on section 7118. The following notes of the history of this mine, compiled from information obtained from various sources, were published by the Government Geologist in connection with his report on the mine of July 21st, 1897:—

It is alleged that whilst the section of land upon which the German reef is situated was in the occupation of an agricultural settler, the surface stones were thrown aside with the view of clearing the land for tillage, and that these were a little later discovered to be auriferous. This led to a search, resulting in specimens being sent to Adelaide so rich as to create great excitement, and doubts whether they could come from any mine in South Australia. It was affirmed they must be from Eaglehawk, Victoria. Mr. Arthur Boyle, who had come to the colony to manage the Almanda Mine, examined the property, and, with the assistance of some leading colonists, commenced development. This was about 1870. The *Register* of February 7th of that year relates the arrival of a specimen containing 8ozs. of gold, with others of smaller size, valued altogether at £60, which had been obtained from this reef. The German Reef Quartz Mining Company was formed on the 11th of that month. Great excitement arose, and shares were bought at very high prices, buyers urgently offering no less than £200 for a share interest. It was reported that the reef had been cut in several places, and crushing showed gold wherever tried. The length of reef shown to be gold-bearing was about 600ft., and in two places was, according to statement, very rich. On the 13th August it was stated that a shaft had been carried down on the underlie to a considerable depth. The first crushing gave a return from 49 tons of stone of 1oz. per ton. At a half-yearly meeting of the shareholders, on September 10th following, it was announced that 321 tons of ore had been crushed and the company held £200 worth of gold and £890 in cash; that 12 tons of stone had yielded 24ozs. 15dwts. of gold, though no gold had been visible

in the stone prior to crushing. On September 15th, 1870, rich specimens of auriferous quartz were brought from the mine, and shares were quoted at £100 to £105 each, but rose on the 24th to £200. On the 27th of that month three cakes of gold, weighing in all 177ozs., were publicly exhibited, the result of 10 days' crushing in a 5-head battery. On the 11th October following, a crushing yielding 116ozs. 16dwts. was obtained from 62 tons of stuff, the stone having been taken from a depth of 12ft. to 16ft. The English, Scottish, and Australian Chartered Bank is stated to have purchased in 1870 and 1871 395ozs. 14dwts. of gold, valued at £1,527 2s. 6d., from this mine. Two dividends, respectively £2 and £2 10s. per share, were declared, and it was stated that the success of the German reef had given a renewed impulse to mining in South Australia. The width of the portions of reef that were removed varied from 2ft. to 6ft. in one of the workings, and in the other, where the outcrop measured from 2ft. to 5ft. in width, the reef at a depth of between 90ft. and 100ft. pinched to about 6in. After working for some time with unsatisfactory results operations ceased, and at the period when the mine was examined by Professor Ulrich, early in 1872, the property had for some time been left unworked.

It is difficult to assign adequate reasons why this mine should have been so suddenly abandoned after such excellent returns had been obtained.

An attempt was made about 1881 or 1882 to again develop the reef, in connection with an adjacent claim upon which gold had been found, but it was not long ere the mine was again abandoned, the yield from the stone having fallen to a few pennyweights per ton; but some good results were obtained, permitting the payment of a dividend. Shares had meanwhile, in view of that circumstance, again changed hands at high figures. In 1887 the manager for another company which had been formed to work the German reef reported, in March of that year, that there were at surface about 50 tons of highly ferruginous stone which had been raised from a depth of 30ft., containing limonite and sulphides of iron, with fine gold often visible, of the assay value of 1oz. to 3ozs. or 4ozs. per ton. In the ferruginous oxide the gold was of a coarse description. After this indication of the possibilities of the mine, it appears to have again closed down.

In these notes sufficient evidence is furnished that on this property there is a reef, the outcrop of which has proved rich in gold, but which has been worked in an erratic manner, and finally abandoned after all the rich easily-worked surface stone had been removed.

The conclusion to be arrived at is that this auriferous reef has been used as a medium for speculation only, and that no well-organised or systematic attempt has been made to properly mine and develop it. The rich easily-reached stone has been taken out probably to water-level, or to some place where the ground became hard and the reef pinched and became poorer in gold. When this point was reached the difficulties were doubtless considered too great to overcome, and the possibilities of what might be found at lower levels were lost sight of, none of the parties who from time to time held the ground having sufficient confidence in mining enterprise to enable them to undertake the sinking of a main shaft, and the putting in of the necessary drives to prospect at a depth for the continuation of the two shoots of auriferous stone worked at and near the surface.

Professor Ulrich, writing in 1872, says:—The reef shows a well-defined outcrop for above 20 chains in length, running over a long, gently-sloping hill, across a gully, and up another hill, at a strike of N. 15° E., and dipping W. 15° N., in places steplike, steeper and flatter at angles varying from 25° to 50°. The rocks which it traverses strike N. 40° E., and dip W. 40° N. at 55°, and consist, as at the Criterion reef, of highly micaceous metamorphic sandstone, alternating with mica schist. With regard to the auriferous character of the reef, a man in charge of the place (who was employed as a miner during the whole period the reef was worked), gave me all the information embodied in the following description:—Gold was found in the outcrop for a distance of at least 10 chains, and in two places extremely rich. At

one of these places, low down the slope of the first long hill, the reef has been worked on the underlie to a depth of about 40ft., and for above 100ft. in length. It shows in the faces tolerably well-defined walls, and an alternating flatter and steeper dip. The thickness of the portion removed varied from 2ft. to 6ft., and the quartz became rapidly poorer in depth—the average yield of that last raised having been from 3dwts. to 5dwts. per ton. The second place where rich gold was found lies on the top of the hill, but the outcrop here has only partially been worked. There exists, however, a fine vertical shaft, which struck the reef at a depth of between 90ft. and 100ft., but rather poor, and only about 6in. thick, whilst its thickness at the top ranged from 2ft. to 5ft. in places. The quartz all along the outcrop is rich in iron pyrites, and some shows, by its cellular texture and very ferruginous character, that much of this ore has been decomposed. The latter becomes, however, still more abundant in depth, and the fine seamy quartz raised from the large vertical shaft on top of the hill contains it perhaps at the rate of 25 per cent. to 30 per cent. In cases of such strong increase, in connection with a decrease of free gold in depth, it has generally been found in Victoria that the pyrites is payable and sometimes evenly richly auriferous. Mr. Mathew Barker, the late mining manager of the reef, evidently remembered this fact from his Victorian experience, for by a simple contrivance attached to the crushing machine he saved several tons of the ore, which are stacked in bags near the plant. Should an average sample of this have been assayed with the result at the rate of not less than 20zs. per ton, its treatment, in the manner practised at Clunes and Bendigo, would no doubt be a payable undertaking, and might render the reef profitable to work. But, irrespective of this, on considering the fine development of the reef, the large extent of it as yet unworked, though proved auriferous, and that a fine crushing plant is at hand supplied with good gold-saving appliances and plenty of water at command, I cannot help thinking that another attempt at working it—with special attention being paid to the possible occurrence of the gold in shoots—would be advisable, and might be attended with better results than the first. For opening it at greater depth than hitherto reached there would be required, however, another main shaft, lower down the hill towards the first workings, and farther off in the direction of its underlie than the one existing on top of the hill. The surface round the reef and the adjacent gullies have not as yet been worked, though they are in all probability payable auriferous.

The Government Geologist's report (21-7-97) points out that this is not a reef which is now being worked—where information can be gained regarding its size, richness, and other characteristics, by an examination underground—but on old workings which have lain idle for years. In consequence of this the position of the reef outcrop can only be fixed by that of the open cuts made in removing the auriferous stone, and by shafts sunk for the same purpose. From an examination of these, so far as they are available, the following information is given:—The reef outcrops along a ridge of rising ground extending N. 15° to 20° E. up a gradually sloping spur rising out of the alluvial flats of the Torrens River. There are two open cuts where the reef has been worked down by following the underlie from the outcrop downwards. No. 1 S. is an open cutting 160ft. long, from which the veinstone has been taken and stoped downwards; it traverses metamorphic micaceous sandstone and slaty micaceous rocks, which in some places appear to have an anticlinal form. This outcrop is, according to reliable information, that from which the rich auriferous quartz was obtained at the time the reef was first worked. The walls at present seen are well defined, and the underlie is to the W. from 45° to 60°. A block of quartz 3ft. wide is all that remains of the reef in this cutting, stoping having evidently been carried on to a considerable extent, portions of the old stopes and timbers being still visible. To what depth stoping has been carried on cannot be ascertained with certainty, but it is probably not more than 100ft. At 80ft. N.W. of the N. end there is a vertical shaft, which has evidently been sunk to cut the reef on the underlie; its depth at present is 46ft., but it has probably fallen in. No. 2 N. is an open cut, about 100ft. long, where the reef has been stoped

out on the W. underlie at angles varying from 45° to 60° . This work is said to have been done at a later date than that of No. 1, and, like it, to have been carried out on a reef rich in gold. Four vertical shafts have been sunk to the W., evidently with the intention of cutting the reef on the underlie. One of these, known as the 90ft. shaft, is 200ft. W. of the cutting. No reliable evidence is obtainable as to what was met with in these shafts. Between cuttings Nos. 1 and 2 there are at intervals costean pits, in some of which bunches and veins of quartz are visible which represent the reef outcrop.

To sum up: The whole length of the reef outcrop from the S. end of No. 1 cutting to the N. end of No. 2 is 730ft. In this length two shoots of rich auriferous quartz have been stoped out for a distance along the surface of 160ft. and 100ft. respectively, and to an uncertain depth, not likely, however, to exceed 100ft. The information obtained from those who worked the mine in old times points to the fact that quartz extraordinarily rich in gold was found at the surface, and obtained from the reef below. Evidence in favor of this is the number of vertical shafts sunk to strike the reef at lower depths. Altogether, these things are sufficient to warrant the expenditure of the capital required to sink a vertical shaft on the W. side of the outcrop, to cut the reef at 150ft. or 200ft., and from thence to drive along the reef with the object of ascertaining the position of and mine the rich shoots worked in Nos. 1 and 2 cuttings and stopes, as it is almost a certainty that these will be found to go down to considerable depths.

Besides the German Reef workings, there are other reef outcrops worth prospecting. These are near the N. corner of section No. 7119. A small reef outcrop striking N. 15° E., and dipping some 45° W. A small quartz reef striking N. and S., and dipping W. at an angle of 45° . The quartz has a very favorable appearance for gold. E. of No. 2 open cut is a strong outcrop of quartz and ironstone. It trends N. 10° W. for 100ft. Alluvial gold has been obtained near the N. and S. ends of this reef, and has most probably been derived from it. Alluvial and surface gold have been obtained at several places on these sections (Nos. 7118 and 7119), and just outside the N.W. boundary of section 7119 the auriferous surface soil contains large quantities of quartz and ironstone, indicating that auriferous veins are in the immediate vicinity. The alluvial flat bordering the Torrens River is most probably also auriferous. The highest elevation of the surface, where the reef outcrops, does not, by barometrical measurement, exceed 100ft. above the flats of the Torrens River.

In 1897 some trial parcels were taken from a quartz outcrop some little distance from the old workings, and 31 tons 2cwts. treated at the Mount Torrens Battery and Cyanide Works returned 2ozs. 16dwts. 20grs., valued at £10 2s. 2d., the average yield being worth 6s. per ton. Samples from the same place assayed from a trace to 3dwts. per ton. A parcel of tailings from the old dump was also treated; these assayed 3dwts. 6grs. per ton.

Golden Crown.—Situated a short distance N. from the Lucky Hit. In May, 1896, it was reported that a shaft was down 65ft., where there was a lode 5ft. thick, upon which a drive was being extended N.W., and that rough gold could be seen in the stone.

Golden Crown No. 2.—In a vertical shaft at 20ft. a reef was struck, width 1ft., the quartz and ironstone heavily charged with mundic. It was stated that in much of the stone gold was plainly visible. Sinking was continued on the course of the lode, depth (August, 1896) 45ft. The lode was widening, the width being 2ft. 4in.

Golden Crown No. 4.—Shaft down 20ft., drive 10ft., opening on a ferruginous quartz lode, which, it was alleged, was carrying good gold. Another shaft down 65ft., with 55ft. of drive at the 40ft. level on the course of the lode S.E. and N.W., which, it was stated (August, 1896), looked very promising.

Work was discontinued on most of the small holdings in this vicinity on water-level being reached.

Golden Slope and Golden Slope West, held in 1895 by the *Mount Pleasant Reefing Syndicate*.—Situated about 1 mile S. of Mount Pleasant township. The Government Geologist examined the property in 1895, and reported that the gold-bearing veins consisted of oxide of iron, quartz, and claystone, with decomposed granite traversing micaceous schist and kaolinised micaceous rock, the whole forming a combination of dyke and vein formation. A shaft had been put down on the underlie (60° to 70° E.) to water-level at 75ft., and 150 tons of veinstuff yielded 30ozs. of gold. In another shaft there is, at a depth of 20ft., a quartz reef 5ft. or 6ft. wide. Alluvial gold had been worked on the surface of this property, and in auriferous gullies; the locality was known as the Mount Pleasant diggings, which yielded over a thousand ounces of gold between 1870 and 1883. In the *Golden Slope West* there are auriferous veins in an outcrop consisting of quartz, gossan, and ironstone in micaceous and kaolinised strata. Some rich patches of gold-bearing ore have been met with in the reef at a depth of from 60ft. to 80ft. In all the reefs gold has been found in patches, generally rough and flaky, and fine gold has been obtained by washing. The amount of prospecting done is limited, and if systematic exploratory work were pursued it is probable that other rich deposits would be found. A main shaft should be sunk, from which the several reefs could be tested at depth, and fossicking for rich specimens should cease.

Golden Slope West.—Situated on sections 1287 and 1288. The Inspector of Mines visited the property November 11th, 1899, and found that, as the workings were full of water, they could not be examined. The shaft, at which was erected a horse whim, is stated to have been sunk to a depth of 120ft., exposing the reef, 6ft. wide, of soft friable material, containing a large percentage of pyrites carrying free gold. Considering the large quantity of alluvial gold obtained from the Mount Pleasant district, the lode formations deserve prospecting. (I.M.R., 8-11-99.)

The Inspector of Mines again visited this property in May, 1900, and reported that it had been recently taken over by an English company. A vertical main shaft, well timbered and divided into three compartments, had been sunk for 90ft. An engine, winding plant, and appliances for sinking 300ft. or 400ft. were in position, and it was intended to continue the shaft to the former depth, and then crosscut to intersect the various formations known to exist, and from which rich stone had been previously obtained. (I.M.R., 17-5-00.)

Golden Slope (later known as *Duke of Cornwall*).—Situated near Mount Pleasant; section 1286. A large quantity of gold was extracted near the surface when first found. Several gold-bearing formations run through the mine, striking N. and S., with an E. underlie, and are composed principally of micaceous quartz and claystone, with decomposed granite strongly associated with iron. In about the centre of these formations a main shaft, 11ft. long by 4ft. wide, has been sunk to a depth of 168ft., and is well timbered from top to bottom. At the 152ft. level a crosscut passes through three lode formations, ranging from 3ft. to 7ft. wide. The first is 3ft. wide, and is composed of quartz veins and slate highly mineralised; the second consists of micaceous quartz, gossan, and micaceous schist; the third, which is 7ft. wide, contains veins of quartz, claystone, and decomposed granite, strongly associated with oxide of iron, while the enclosing rock is decomposed granite, micaceous schist, and kaolinised material. The appearance is that of a large auriferous dyke, with every indication of persistence both in length and depth. The face of the crosscut is apparently again entering lode material, and the inspector is of opinion that it should be continued at least another 70ft. or 80ft., when, in all probability, the main E. ore body will be pierced. A crosscut should also be made W. In the early days of the Mount Pleasant Goldfield gold was obtained in rich veins and pockets near the surface on this mine, and if prospecting is continued the same conditions may be expected to be found in the lower levels, with probably a much larger quantity of auriferous pyrites. (I.M.R., 17-4-02.)

It was decided to test this ground at depth by means of a Government diamond drill, and the work was done in 1904. At a depth of 546ft. a lode, consisting chiefly of pyrites, was met with, which was proved to be 3ft. in thickness, but assays of the core gave no return of gold. At 733ft. small seams of quartz, carrying traces of gold, were passed through. At 739ft. the core assayed 1dwt. 12grs. of gold per ton. The bore was continued through granite rock to 751ft., at which depth operations ceased.

Golden Slope North.—Adjoining and to the N. of the Golden Slope West. The property consists of two 9-acre blocks and one 20-acre; one of the small blocks is private property, leased to the present holders, and it was on this block that Mr. Toy made a very rich find a few years ago, the remainder being gold leases under the Mining Act. Through the two 9-acre blocks the surface shows a strong granitic formation, fully 400ft. in width, traversed by kaolinised granite dykes, containing veins of iron-stained quartz, which in places have proved highly auriferous, and have doubtless been the source of the rich alluvial deposits known as the Mount Pleasant Goldfields. The work comprises a number of small openings and shafts, sunk to various depths, the principal shafts being Nos. 1 and 2, sunk on the underlie to the depth of 79ft. and 90ft. respectively; the former is in the 9-acre block of private property, and shows the formation from 2ft. to 3ft. wide. To about 30ft. the ore extracted was exceedingly rich, the records at the Mount Torrens Government Cyanide Works showing that 48 tons yielded 179ozs. 14dwts. of smelted gold; and, in addition to this, the local bank records show receipts of large quantities of gold obtained from this place by washing and crushing in the most primitive manner. No. 2 shaft is in the second 9-acre block, and is in a dyke formation, apparently of considerable width, containing seams and veins of siliceous lode matter, but poor in quality; the shaft is evidently not on the same strike of country as No. 1. To thoroughly prospect and develop this property two vertical shafts should be sunk, one on each 9-acre block, each 200ft. deep, intersecting the main veinstone at that level. The past returns for the little surface work done, and the present prospects, would justify the expenditure necessary in testing the auriferous formations known to exist here, and which have, so far, not received the attention they deserve. (I.M.R., 8-11-99.)

Gowland's Reef.—Locality, 1 mile from Mount Torrens Battery. One hundred and one tons 8cwts. 3qrs. treated at the Mount Torrens Battery and Cyanide Works returned 29ozs. 11dwts. 4grs., valued at £106 7s. 3d., the average yield being worth 21s. per ton.

Haddy's Reward.—Locality, N. of the *Lucky Hit*. A report was made in November, 1896, that a vertical timbered shaft had been sunk 86ft., water-level; that a quartz and ironstone lode had been cut in the 70ft. level, carrying gold, an assay procured by the prospectors returning 3ozs. to the ton; two tunnels had been driven, and in one an auriferous reef had been struck, and also two nice leaders on the top of the hill.

Heinrich's Mine.—Section 116, originally known as *Scott's Reef*, and later as the *Talunga Goldfields Development Company*, and worked by an English company, who placed a large machinery equipment on the ground. The Government Geologist reported in March, 1896, that there was a shaft 25ft. deep, from which drives N. and S. had been put in, following the reef, which consists of quartz and kaolin in veins and enclosed masses in the joints of the quartz. The reef varied in width from 5ft. to 3ft., and looked likely to be permanent. There was coarse gold visible in the solid quartz. No stone had been treated by battery, but the owner of the claim stated that 141ozs. 15dwts. 5grs. of gold had been picked and dollied out from the stone raised. The auriferous surfacing had proved that the reef contained gold for about 5 chains along the outcrop, and it was reasonable to expect that a corresponding length of auriferous reef or vein would be found below. A favorable looking quartz vein, containing much iron oxide and pyrites, had also

been opened up, width 12in. to 17in., which would probably join or intersect the main reef. The country rocks are composed of kaolinised slate or pipeclay, micaceous sandstone, argillaceous sandstone and slate. A payable mine should be developed by skilful and systematic working.

Inspector Matthews reports:—Situated about 2 miles from Mount Pleasant township. The lode, consisting of a very white porous quartz, strikes 20° E. and underlies to the W. It has been explored by shallow workings for a considerable length, and, from reports furnished, yielded from time to time large quantities of gold, which occurred in very rich patches, not, at the present shallow workings, continuous. The two principal shafts sunk are the N. and main shafts. The former has reached a depth of 140ft. on the lode underlie, and a considerable amount of driving and stoping has been done on the course of the lode. The main shaft, which is 13ft. by 4ft. 6in. in the clear, has been sunk to the depth of 156ft., passing through the lode at 130ft. from the surface. The stone at this point is of very low grade, but by driving N. or S. good shoots of ore will probably be met with, similar to those found in the upper workings. All the work done recently (3-10-99) is of the most substantial character; poppet heads, tram roads, large pumping and winding engines, together with all the usual appliances for deep sinking have been erected; also a large portable engine, with 10-stamp mill, is on the mine, and could, if necessary, be readily placed in position. Seeing that the largest portion of opening up the mine has been accomplished, the inspector considered that it was then advisable, not only to continue prospecting at the present level, but also to resume sinking and prove if the gold value in the lode will not become more continuous as depth is attained below the water-level. (I.M.R., 3-10-99.)

The operations did not result successfully, and the company was wound up.

Howell's Syndicate.—Prospecting work was carried on in three of Wagner's paddocks, Blumberg. In No. 1 a large reef was struck. (June, 1896.)

Jessie Darling.—Section 1303. It was reported in August, 1896, that in an underlie shaft at a depth of 20ft. there was a lode 3ft. wide. Thirteen and a half tons treated at the Mount Torrens Cyanide Works returned 4ozs. 13dwts. 1gr. of gold, valued at £16 19s. 1d., the average yield being worth 25s. per ton.

Kathleen.—This was formerly known as the *Wild Pigeon*, and adjoins the Cobra. In 1895 it was being worked by an Adelaide syndicate, and an underlie shaft was down 80ft. A reef 2ft. wide was reported to have been struck, and samples sent to the School of Mines gave high assays. When sinking the prospectors cut into an old tunnel of 300ft., driven 30 years before in following veins of copper ore.

Lilian.—Adjoins the Golden Crown No. 1. A shaft had been sunk 40ft. (August, 1896), where the lode was found, and prospects were stated to be good, fine and coarse gold being obtained by the dish.

Little Crumb.—Situated near Blumberg, on a district road, adjoining and to the S. of the Lucky Hit Mine. A considerable amount of work has been done at shallow depths on auriferous veins from 6in. to 12in. thick. Further development is recommended by sinking a main shaft below the old workings, and, owing to the character of the enclosing rock, the work should not be expensive. (I.M.R., 27-9-99.)

Seventy-seven tons 11cwts. 2qrs. treated at the Mount Torrens Cyanide Works gave a return of 136ozs. 4dwts. 7grs. of gold valued at £516 5s. 7d., the average extraction being worth 133s. per ton.

Lucky Hit.—Section 6397. The Government Geologist, reporting upon this property in August, 1896, stated that the auriferous veins were similar to those in Hynes' reef, varying in size but persistent, cutting through and across the bedding of the country rock. Shaft, 45ft.; good prospects washed, and gold frequently seen in the veinstone. A parallel reef of a similar kind, 100ft. N.W., had been worked. These reefs and those in Hynes' property belong to the class called "mullocky," and will probably continue to a considerable depth. He thought it likely that other parallel veins would be found.

Inspector Matthews reports:—Through this property there are four lodes and veins of ferruginous quartz, ranging in size from a small streak to, in places, 3ft. wide; work has been in progress on these almost continuously for the last four years, with the result that a considerable quantity of gold has been obtained. The operations are confined to a number of small shafts and drives in various parts of the property, from 40ft. to 60ft. in depth, and no permanent work has been accomplished. The country rock is of the most favorable character, and a good main shaft should be sunk about the centre of the lode formations and crosscuts driven, to test the value of the auriferous veins at the deeper levels. (I.M.R., 27-9-99.)

The inspector made a further report in May, 1900. The mine was then owned by an English company, and the main shaft was sunk to a depth of 120ft., securely timbered and centred. The manager stated that the necessary machinery would shortly be procured, and the shaft carried down another 100ft., previous to cross-cutting. The shaft was in a good position for future developments. (I.M.R., 17-5-00.)

In May, 1896, a 20½-ton parcel treated at the Mount Torrens Cyanide Works gave a return of 2ozs. per ton. In July 20 tons gave a return of 1oz. 10dwts. per ton. In September a parcel of 7 tons gave a return of 4ozs. per ton. In October, 1898, 30 tons gave a return of 1oz. 10dwts. per ton. In December, 1904, a parcel of 22 tons was forwarded by some prospectors from the mullock dump, but it was found that it would not pay for crushing and carting. The total ore treated at the Government works was 338 tons 16cwts. 1qr., which returned 303ozs. 6dwts. 3grs. of gold, valued at £1,148 2s. 11d., the average extraction being worth 67s. per ton.

Lucky Hü North.—An underlie shaft 45ft. showed (August, 1896) a 2ft. lode, consisting of auriferous quartz and kaolin, yielding good prospects. The country is difficult to work owing to the rotten nature of the ground.

Lucky Hü Junction.—Ground hard; reef cut in a shallow hole, from which auriferous stone was raised. Two vertical shafts, 30ft. and 42ft., had been put down; it was uncertain whether the stone was payable. (September, 1896.)

McVittie's Hill.—Section 6340. Here shafts were sunk on a quartz reef; their depths range from 40ft. to 60ft. The yield of gold per ton is said to have been 10ozs. 11dwts. Gold can be seen in some of the fragments of quartz lying near the shafts. This mine was known as *McLean's Triumph*.

Mount Pleasant Diggings.—Sections 1286-90. The Government Geologist, reporting in 1886, says that a considerable amount of digging had been done here about 18 years before. Two long gullies have been worked for alluvial, and several small shafts sunk to the bedrock, prospecting the quartz reefs. No information could be gained as to the total amount of gold procured from this locality; but on July 31st, 1871, the Warden of Goldfields estimated that £8,000 worth of gold had been obtained, and the manager of the Bank of South Australia at Mount Pleasant stated that from February, 1870, to July, 1883, 729ozs. of gold from this field had passed through the bank. The English, Scottish, and Australian Bank bought 360ozs., value £1,374 17s., during the same period. (G.G., 1887.)

Later—Toy's Find was made on private property, section 7070, adjoining; and the Golden Slope, Golden Slope North, and Golden Slope West mines were worked on the sections before mentioned.

Mount Torrens.—Section 6537. This property, 2½ miles from Blumberg, was worked originally as an alluvial claim under the name of the *Criterion*, and good patches were found containing heavy gold.

The Inspector of Mines reported (1889) that a vertical shaft should cut the reef at the depth of 145ft.; it has an E. and W. strike, with a dip N. 1ft. in 4ft. The reef, averaging 4ft. in width, is composed of quartz, iron pyrites, and a flucan carrying free gold. One hundred and forty tons, put through an ordinary battery, yielded 7dwts. gold to the ton, whilst two parcels sent to the smelters averaged 1oz. 2dwts. per ton. Two hundred and twenty tons gave 6dwts. of free gold to the

ton, but the tailings assayed 1oz. 10dwts. of gold and several ounces of silver to the ton. The Inspector was present when a parcel was treated, and 4cwts. No. 1 concentrates assayed 6ozs. 8dwts. gold and 9dwts. silver per ton; No. 2 assayed 2ozs. 17dwts. gold and 4dwts. silver per ton. On an application for a Government subsidy the Inspector examined this mine in April, 1890, and reported that the lode averaged 4ft. wide of quartz and pyrites, and appeared highly payable. Samples taken assayed respectively, 14ozs. 14dwts. of gold and 7dwts. of silver per ton; 9ozs. 18dwts. of gold and 7dwts. of silver; 3ozs. 15dwts. of gold and a trace of silver; 5ozs. 4dwts. of gold and 2dwts. of silver; and 8ozs. 13dwts. of gold and 5dwts. of silver. There was bismuth in four of the samples.

This property was subsequently purchased by the Government, and a public crushing battery and cyanide works established on it.

In May, 1898, two prospectors sunk a prospecting shaft on a quartz outcrop on what is known as Goat Hill, about 25 chains E. of the Old Mount Torrens main shaft, on the strike of the lode. In July this shaft was taken over by the Government and worked by them, in conjunction with the battery and cyanide plant, under the direction of the manager of the cyanide works. The Inspector of Mines, reporting on September 27th, 1899, stated that the work done at this place up to date comprised a shaft sunk to the depth of 140ft. on the underlie of the lode, which strikes E. and W. and dips to the N. At the 60ft. level drives have been made along the lode E. and W. about 60ft. each. The lode formation is from 18in. to 2ft. wide and contains 12in. of solid stone. At the 140ft. similar drives have been made, and the E. one is 60ft. from the shaft. The lode is fully 18in. thick in the face; and in the back of the drive for the full length there is an average thickness of 12in. of solid stone, giving a large block of payable stoping ground up to the 60ft. level. The W. drive had been extended to 40ft., the reef ranging from 6in. to 12in. in width; the face was rather poor, being only a small seam of rubbly quartz, but the continuance of the drive would probably intersect other shoots, indications of which appear on the surface. Up to date 255 tons had been treated at the Government Battery and Cyanide Works, and had about paid expenses. Thirty tons were still waiting treatment. (I.M.R., 27-9-99.)

The shaft was subsequently continued to 213ft. on the underlie. The ore raised from the surface to the 60ft. level yielded 9dwts. 23grs. of gold per ton; from the 60ft. to the 140ft. level the yield was 10dwts. 10grs. per ton; and from the 140ft. to the bottom level, viz., 213ft., the yield was 10dwts. 15grs. per ton. The total quantity of ore raised and treated at Mount Torrens Battery and Cyanide Works was 1,252 tons 11cwts., which returned 652ozs. 10dwts. 16grs. of gold, valued at £2,483 18s. 5d., the average extraction being worth 39s. per ton. The whole of the work done on this shoot of ore paid expenses, including cartage to the battery and crushing and cyaniding charges. The shoot of ore at the 60ft. level was 66ft. long; at the 140ft. level, 128ft. long; and at the 213ft. it was 140ft. long, and averaging throughout 1ft. wide. The ore contained a fair percentage of pyrites, but with the battery treatment followed by cyanidation of the tailings a high extraction was obtained at the Government works. The depth attained, viz., 213ft., was as deep as could be conveniently worked with the prospecting shaft then in use; and this shaft, after being unworked for 12 months, fell in during the next heavy winter. Other prospecting on this section was done, two tunnels being put in the hill. In one small leaders were met with, and 17 tons 4cwts. treated returned 12ozs. 2dwts. 17grs. of gold; but this was quite distinct from the shoot of ore above referred to.

New Republic.—Adjoins the Golden Slope West. A lode 3ft. wide was cut at 23ft., and sinking was continued. The lode appeared to widen in depth, and was reported to give prospects of fine gold.

Penrhyn Mine.—Section 6332. Rich surfacing was got here. Shafts were sunk on quartz reefs in the vicinity, but no payable stone was found, so the mine was abandoned and the shafts collapsed. In October, 1875, prospecting operations were resumed.

About $2\frac{1}{2}$ miles from Blumberg. The workings consist of four small shafts, from 16ft. to 58ft. deep, along the line of lode and connected by drives at various points. The lode formation is from 4ft. to 5ft. wide, strike N.E., with a W. underlie of about 45° , and contains veins and bunches of ferruginous quartz. At the bottom of the deepest shaft, 58ft., is exposed on the footwall side of the formation a vein of quartz 15in. thick, heavily charged with iron and pyrites, and dipping rapidly to the N. From this level and above, three parcels of ore have been treated at the Mount Torrens Government works with the following results:—Ten tons, 12dwts. 21grs. per ton; 13 tons, a little over 17dwts. per ton; and 13 tons, 15dwts. 16grs. per ton. These returns are very encouraging, and for the future working of the mine a vertical shaft should be sunk much further W., with the object of intersecting the lode at a depth of 200ft., the upper ground being worked by a crosscut at the 100ft. level. (I.M.R., 17-6-02.)

The total amount of ore treated at the Mount Torrens Cyanide Works was 98½ tons, which returned 54ozs. 7dwts. 20grs. of gold, valued at £194 7s., the average extraction being worth 40s. per ton.

Port Adelaide Syndicate.—Prospected Crown lands at McVittie's Hill, and in the middle of April, 1890, at a depth of 35ft., a reef 18in. thick was struck, showing free gold.

Recompense.—Situated between Blumberg and Mount Torrens. In putting down an underlie shaft it was reported that an auriferous reef was cut, about 1ft. wide, the vein carrying quartz and ironstone. A vertical shaft was also started. (1894.)

St. Patrick.—On section No. 2. An underlie shaft 150ft., with a wide formation, carrying gold. The lode, it is said, dips suddenly at 130ft. Rich gold specimens were occasionally found, but the mine has been abandoned. The lode is wide and continuous, consisting of ironstone, gossan, pyrites, and quartz, bearing N. and S. There is also a large outcrop of baryta or heavy spar, apparently a lode. (Government Geologist, 1895.)

Subsequently a large amount of ironstone flux was taken from this place. Later it was worked for ochre, and named at first the *Talunga Ochre Mine* and afterwards *Mount Sienna*.

In December, 1906, the Government Geologist reports:—A lode outcrop, extending through section No. 2 in a N.N.E. direction, has been followed down by a shaft, underlying E. to a depth of about 70ft., and connected with a vertical shaft to water-level at a depth of 90ft. The lode material consists of quartz, brown iron ore, gossan, cellular quartz, pyrites, talcose, and micaceous clays and kaolin. The country rocks are chiefly claystone and micaceous and argillaceous sandstone. The mine was originally worked for gold and latterly for flux, procured at a depth of 70ft., where rough excavations of considerable extent have been made. Through the decomposition of pyrites the argillaceous lode material and the containing country rock have been penetrated in places by oxide of iron, coloring them yellow, brown, and pink. Yellow and brown ochre, derived from the same source, also occur in pockets and irregular-shaped masses in connection with brown iron ore and clay ironstone concretions; at other places along the outcrop the country rock is stained with oxide of iron in a similar manner. I have been asked to give an opinion as to the quantity of material available for treatment, but find it impossible to do so on account of the irregularity in mode of occurrence as at present shown. Further prospecting and development above water-level should disclose additional ochre-bearing bodies. (Government Geologist, 10-12-06.)

A wide lode formation traverses the property for a distance of 60 chains, striking N. and S., and dipping E. at an angle of 30° . A little distance E. of the outcrop a shaft has been sunk vertical for the first 30ft. and from there on the underlie for a distance of 100ft., following the dip of the lode, exposing an ore body of from 3ft. to 10ft. wide. About 2 chains E. of the underlie shaft, a vertical shaft, 8ft. by 4ft.,

has been sunk to a depth of 127ft., and close timbered. This at present is the working shaft, and is equipped with poppet heads and winding engine. At 80ft. level a plat has been cut out 12ft. by 12ft., where a steam pump has been fixed to pump the water out of the shaft for the treatment plant on the surface. The principal work carried on at present underground is at the 80ft. level. A crosscut has been extended from the plat for a distance of 50ft., when the formation was intersected, which is about 30ft. wide at this point. The ore has been taken out here for the full width of the lode, and the place has been well timbered, and a start made to drive N. and S. The N. drive has been extended 20ft. The lode in the face is 14ft. wide, and consists of sienna, ochre, and iron pyrites. The S. drive has been extended 5ft. The matrix of the lode is the same in both drives, and also in the upper levels, where little driving has been carried on both N. and S. at the 70ft., 50ft., and 30ft. levels. The treatment plant consists of a ball mill and engine to drive same, eight settling pits, 12ft. by 6ft. by 1ft., and a small roasting furnace. Both the winding and horizontal engines are supplied with steam from a 20ft. Cornish boiler. This mine has a good supply of both sienna and ochre in sight from the present level to the surface, and if equipped with a more modern crusher it should turn out a profitable concern. When at the mine I took six samples of the ore from different parts of the mine, which were assayed at the School of Mines. Some of them showed traces of gold. I expect, when the drives on the course of the lode are further extended to where it intersects the quartz reefs, it may be found to carry rich patches of gold. (I.M.R. (Jones), 4-10-07.)

Sections 6572, 1673, 6396, 6397, 6624, 6625, 116, 6558, 6511, and others.—More or less alluvial gold has also been found on all of these sections. In some instances it is known that the quantity taken out was large, but there are no means of giving anything like accurate total figures.

The Government Geologist reported in 1895 on the following sections :—

6335.—A quartz reef 8in. to 10in. thick, remarkably well defined and apparently permanent in character, exists upon this property. The country is auriferous, and probably other veins exist. A certificate of assay of the reef-stone showed 1oz. 7dw's. 10grs. to the ton, leaving 2dwts. 11grs. in the tailings.

6593. Small quartz reefs outcrop, containing oxide of iron and pyrites; flats likely for alluvial gold.

6334.—A reef crosses the S.E. corner, from which, it is reported, rich specimens of gold were obtained; workings had fallen in.

1305, 1306, 6625, 6396.—Quartz reef outcrops occur, looking likely for gold; some had been worked to a shallow depth. The most promising reef shows on the surface in the S.W. corner of 6625, running thence into 6396.

126.—The N. end is in a line with the strike of the Black Snake reef (section 127), and in a small creek alluvial gold was being worked.

125.—A strong auriferous reef of laminated quartz had been exposed containing pyrites, and should be tested.

108.—The continuation of the German reef should be looked for here.

6627.—The N.W. portion is on the trend of the Black Snake reef.

6626.—There are two veins, 12in. and 10in., neither showing gold; but in the S.E. corner there is an outcrop which is apparently a continuation of Wagner's reef; the stone is favorable.

6625.—The reef above described passes into this area, and in the S.E. corner a patch of alluvial gave rich returns. Its working exposed a reef, which was probably the source of the gold. This place should be thoroughly prospected.

6397.—A reef was being worked near the S.E. corner and was giving good returns; it is parallel to the last-mentioned reef.

7117.—There are many outcrops of quartz, but apparently no defined reefs or veins. If the German reef is continuous it should traverse the S.E. portion of this section.

The Government Geologist thinks that there is a fair probability of alluvial gold being found in the creek flats on all these sections.

Talunga Mine.—Sections 109, 110, 114, and 115. Principal workings on section 115. The Inspector of Mines reported (1895) that seven shafts had been sunk 20ft. to 62ft. The lode is strong and well defined, striking N. 20° E., but poor in character. The assays, on treatment at the Government Cyanide Works, gave returns from parcels of ore treated:—12dwts. 18grs. and 1dwt. 10grs. per ton. The lode is patchy, but should be worth further development.

Wegener's (also worked under the names of *Young Australian*, *Blumberg Boulder*, and *Naza Baza*.—The Government Geologist, reporting in 1896 upon this property, stated that a quartz outcrop on section 1633 strikes N. 50° E., from which a good many years ago 50zs. of gold was got out of a small hole. In the N.W. part of the same section is another reef about 5ft. wide, and underlying N.W., the veinstone consisting of cellular and solid quartz, with pyrites and brown iron oxide. On section 1635 there is a vein of the same character, and on this and section 123 there are outcrops apparently on the same line of reef. The widths vary from 1ft. to 8ft. A small flat vein of laminated quartz exists, and from a shaft on this vein quartz of a favorable character for gold was met with. Other outcrops exist, and the property is in a central position in an auriferous district.

Seventy-nine tons 2cwts. 3qrs. treated at the Mount Torrens Battery and Cyanide Works returned 14ozs. 14dwts. 3grs. of gold, valued at £56 9s. 7d., the average yield being worth 14s. per ton.

Wagner's Reef.—Situated about $\frac{1}{2}$ mile from Black Snake. In 1894 an underlie shaft was down 20ft.; lode 4ft. and increasing, strike N.E. and S.W. Lode, ironstone, quartz, and pyrites; good walls. High assays said to have been obtained.

TARCOOLA.

The N.W. country was first explored by John McDouall Stuart in 1858. He named the low ranges of hills which now include Wilgena and Tarcoola the "Warburton Ranges," and called the isolated peak standing boldly out of the flat country between Wilgena and the coast "Mount Finke." The great explorer must have traversed the country during a very good season, as he compares the flats near the Konkaby rockholes, a few miles to the N. of Tarcoola, with the Adelaide Plains.

Aboriginal legends concerning large lumps of gold in a far-away place somewhere to the N.W. of Tarcoola have been heard from the natives of the N.W. and W. coast ever since the earliest days of settlement, and expeditions in search, generally accompanied by aged blacks, have gone out from time to time. So far, however, the precious deposits remain undiscovered, and it is most probable that the legends refer to some glittering micaceous outcrop seen by the aboriginal inhabitants of the now uninhabited country to the N. and W. of Tarcoola. There are also rumors regarding valuable finds of golden nuggets by white men in the early days, but none of these have been found traceable to satisfactory sources.

In 1893 an old goldminer was employed at Yerda, on Wilgena run, as a boundary rider. He considered the country to be gold-bearing, and arranged to go out prospecting after shearing with Nichols, a shed hand. He eventually exhibited some alluvial gold, and a rumor reached Adelaide that a find had been made in the district. It was afterwards proved, however, to the satisfaction of Mr. A. W. Cocks, then manager of Wilgena Station, that the gold displayed had been purchased from one of the shearers, and came originally from Echunga.

In September, 1893, Nichols, with the assistance of Mr. Cocks, started prospecting by himself, taking Yerda as a base. Shortly afterwards Messrs. H. D. O'Halloran, L. Bonnar, and J. K. Acraman reached Wilgena, having come up on account of the

rumors before mentioned. They joined with Nichols, and did a general prospecting trip over the run, and at the end of October Bonnar and Nichols brought to Yerda some dirt from Glenloth (gold locality No. 1), which, on being washed, showed colors. This was the first actual finding of gold in the district. Nichols also found a little alluvial gold on Brown's Hill and at the E. end of Tarcoola Hill (gold locality No. 2), and sold to Mr. Cocks in all 2½ ozs. of alluvial gold, the bulk being found near Glenloth. The Government Geologist arrived at the end of October, 1893. He was favorably impressed with the country, and his observations were embodied in his report for 1894.

In 1896 the late Arthur Battye picked up near the present site of the Tarcoola Blocks battery a piece of quartz showing gold freely; illness prevented him following this up. Mr. Kingsmill's find of a rich specimen of gold-bearing quartz on the surface near Earea Dam in 1899 again called attention to the district, with the result that the Wilgena Enterprise Gold Mine and the South Lake Tin Mine at Earea Dam were found, and general prospecting restarted.

In July, 1899, Mr. W. C. Dawes, who was prospecting on behalf of a Gawler syndicate, came on from Earea Dam in order to investigate the Government Geologist's No. 2 gold locality (Tarcoola). He found gold on blocks 912 and 913, and pegged them out on behalf of his syndicate; at the same time J. Kelly, on behalf of a syndicate, consisting of Messrs. Bellingham, Dedman, and others, pegged 938 and 939, taking in the Glory Quayle Rock.

Mr. Dawes then went to Glenloth, and returning in August found the main contact lode between the granite and quartzite, and started the shaft which bears his name on block 951. He then pegged out 951, 952, and 953, and four blocks at a copper show about 2 miles N.E. The Glory Quayle Syndicate then pegged 935, 936, 937, and two blocks at the copper locality. The Wilgena West Syndicate, consisting of Mr. A. W. Cocks and others, pegged 957, 958, 959, and one block at the copper locality.

The three syndicates amalgamated, work was carried on at Dawes' shaft, and finally the leases were floated into two companies, named the Proprietary and the Wilgena Associated, the holdings extending along the crown of the low Tarcoola Range.

About the middle of 1899 the Hon. A. Tennant, M.L.C., and Mr. C. H. Hakendorf arranged with some prospectors to examine the country near and W. of Wilgena, to which attention had been called by the Government Geologist's report of 1894 and by the finds near Earea Dam. The venture was called "The Western and South Australian Border Prospecting Association." The men, nine in number, received no pay, but were provided with camels, outfit, and rations, and were to receive two-fifths share of any finds made. They divided into two parties of three and six men respectively. Early in February, 1900, the first party—Olsen, Mathews, and Williams—came to Tarcoola and pegged on adjoining Dawes' blocks near Mauser Rock, when they found a little gold. Later in the month the second party also came from Gall's Range to Tarcoola and pegged adjoining Dawes' western blocks to the S., but at first prospected on Brown's Hill. This party consisted of Fabian, McKechnie, Sullivan, Lloyd, Ward, and Baze Mahomet, and early in April Fabian and Ward found rich surface specimens of gold in quartz at the spot now known as Fabian's Shaft; Ward's and McKechnie's reefs were discovered shortly afterwards.

The specimens were of remarkable beauty and value; the news reached Adelaide, and created considerable interest. Mr. L. C. E. Gee, of the Mines Department, was sent up by the Government to investigate the find; his report verified the matter, and a company was formed to take over 10 20-acre blocks surrounding the find, and was named "The Tarcoola Blocks Company." Other leases were taken out and companies formed.

GEOLOGICAL NOTES ON TARCOOLA.

The Tarcoola Range trends in an E. and W. direction more or less continuously for about 10 miles. The rock formation consists of alternating beds of quartzite, quartzose sandstone, siliceous and argillaceous slate and sandstone, interstratified conformably, striking from W.S.W. to S.W., and dipping from 45° to 60° S.E. Beneath these lie granite rocks, generally micaless granite (granulyte); they outcrop at numerous places on the low ground and are associated with diorite, felspar porphyry, hornblendic granite, &c. The quartzite and sandstone series form a range rising some 200ft. above the surrounding country and are exposed to view, while the lower rocks are covered over by red loam and sand and travertine limestone.

The auriferous lodes cross the upper series of rocks approximately at right angles to the strike, and cut through them more or less vertically. Other ironstone and quartz lodes occur, trending approximately at right angles to the last-named lodes in a general direction, conformable to the strike of the stratified rocks and the boundary of the granite. There are also large outcrops of grey quartz rock containing veins of quartz, which resemble lode formations, but may be merely highly-altered beds.

The lodes traverse both the sedimentary rocks and underlying granitic formation, which has uptilted the former along the E. and W. line of upheaval and has caused them to dip off it in a S. direction. The lodes traversing the sedimentary quartzite, sandstone, and slaty rocks, which may be classed as N. and S. lodes, enclose a varying width of country rock or formation, more or less intersected by small veins of quartz, gossan, and ironstone, through which on one or both walls the main quartz vein extends, thinning out and thickening along its course. The richest gold is found in the quartz, ironstone, and gossan of the main quartz vein, but the small subsidiary veins and the quartzite sandstone and slaty rock are also found to contain gold to a greater or less extent.

The lodes occurring in the granitic rocks are sometimes well defined and have good walls, and in other cases they are irregular and mixed with argillaceous and ferruginous material, and partake of the nature of dykes.

Dykes of diorite and amygdaloidal trap are in some places seen; they probably have some influence on the occurrence of gold.

The E. and W. lodes, following approximately the line of junction of the granitic and sedimentary rocks, are generally composed of iron oxide, siliceous iron ore, gossan, &c., sometimes having a considerable width. The lodes have been found, so far as tested, to contain very fine gold and sparsely disseminated. The junction of these with the N. and S. series of lodes has not yet been prospected. The chances are in favor of these being more auriferous at such points of intersection.

Galena and carbonate of lead are found in some of the lodes, and pyrites in most. The gold-bearing stone occurs in shoots, as is usual in most gold-bearing lodes. The dip of the shoots in the Blocks Mine is S., and conforms to the dip of the strata, so far as indicated in the present workings; sufficient work in driving along the lodes has not yet been done to determine whether this may be taken as a constant rule. (G.G., 25-2-02.)

Tarcoola Blocks.—In June, 1900, two months after the discovery, the Government Geologist (Mr. H. Y. L. Brown) visited this locality, and reported:—In McKechnie's shaft (gold lease No. 1005) the lode is composed of quartz, opaline quartz (with common opal), ferruginous quartz, &c., and of a quartzose, argillaceous, and siliceous sandstone formation lying between well-defined walls, some 4ft. apart, which cut through thin inclined beds of quartzite and quartzose sandstone. The lode inclines 76° to 80° E. at the present depth of 30ft.; its strike is N. 25° W. The main quartz vein has a thickness of about 2ft. Rich stone was being obtained.

In Fabian's shaft (gold lease No. 1005) the lode consists of a quartz vein on the W. wall, and a formation of quartzose sandstone and argillaceous rock intersected by small quartz and ironstone veins. The walls, which are fairly defined, are from

4ft. to 4ft. 6in. apart. The lode is vertical to 13ft., and then dips at a high angle, 75° to 80° W., at the present depth (19ft.). The strike is N. 20° W. The quartz vein or reef is traceable on the surface in both directions along the strike, and has been proved to be auriferous, rich gold specimens having been obtained from the surface stone at a distance of 50yds. N., and a short distance S. of the shaft. It is from this shaft that the rich specimens of gold found on the field, which were exhibited in the Minister's office, were obtained. Gold occurs in the casing and also in the formation, and was visible in the stone being raised.

In Ward's shaft (gold lease No. 1004), at the bottom (42ft.), there are two quartz veins separated by sandstone and argillaceous material containing small veins. These veins are 4in. and 14in. thick respectively; they have been found to unite higher up in the shaft, and probably do so again at a lower level. The containing rocks are thin-bedded micaceous and argillaceous sandstone. The strike is approximately N. 15° E., and the general dip of the lode formation is vertical; the quartz veins at the bottom now incline E. and W. Gold is frequently seen in the stone. Auriferous quartz has been found in outcrops S. some $4\frac{1}{2}$ chains to 5 chains, presumably on the same general line of lode.

In the claim W. of Ward's shaft a vein of quartz 3in. or 4in. thick is observed to cut through a quartzite bar. S. of this, quartz stones containing free gold, specular iron, and pyrites have been found, which have evidently been derived from a vein traversing the soft strata, which is covered up by soil and other surface detritus.

In Sullivan's shaft (gold lease No. 1004) a quartz vein is exposed traversing inclined beds of quartzite and quartzose sandstone, striking N. 15° W., and dipping slightly W. The thickness of quartz varies from 1ft. to 9in. at the present depth, 9ft. Coarse gold has been obtained here in the quartz and accompanying lode formation.

O'Loughlin's reef is an outcrop of quartz traversing quartzite and sandstone on lease No. 1005. Gold is visible, and fairly rich specimens have been obtained. The strike of the vein is N. 10° W. No mining has yet been done on it.

Williams' reef (gold lease No. 1013) is a small quartz vein cutting across a bar of quartzite and siliceous slate. It strikes N. 40° W., dips N.E. at 85° , and is exposed for about 15ft. in length in one place, but outcrops again 30ft. N., where it has a thickness of 15in.

Dedman's reef (gold lease No. 1005) is a quartz vein striking N. 36° W. for about 40ft., and cutting vertically through quartzite, its thickness varying from 1ft. to $1\frac{1}{2}$ ft. Good gold specimens are obtainable here. Some of the gold is light-colored through being alloyed with silver. No mining work has yet been done.

Lloyd's reef (gold lease No. 1005) is a small quartz vein striking N. 28° W. through quartzite. No mining has been done. (G.G., 11-7-00.)

The Inspector of Mines (Mr. W. H. Matthews) reports, July 29th, 1901:—The Tarcoola Blocks comprise 10 20-acre gold leases situated about the centre of the Tarcoola Goldfield. The property, in conjunction with several others, is traversed by a strong quartzite ridge striking E. and W.; in places cropping several feet above the surface, and extending for fully 3 miles in length. Almost directly across the quartzite formation there are indications of numerous lodes and veins, striking in most instances about N. and S. On several of these trial pits and shafts have been sunk to various depths, the principal being Sullivan's, Ward's, Fabian's, and McKechnie's; also two tunnels, McKechnie's and Dedman's. At the time of my inspection work in all of these places was being vigorously continued for the purpose of opening up the mine and raising stone for the battery. Each of these shafts is sunk on distinctly separate lodes, in some cases as they continue N. having the appearance of converging one towards the other; but, until further explorations have taken place, that point as to actual contact or junction must remain undetermined. Sullivan's shaft had reached the depth of 105ft., disclosing lode matter from top to bottom, ranging from 18in. to 3ft. wide, walls being fairly good and almost vertical. No drives have as yet been opened, but sinking is still continued on the lode, which at this point is 18in. thick, and up to the present giving every

indication of continuing. The stone raised shows gold freely, and should be of fair average value. Present depth of Ward's shaft is 82ft., first portion sunk being vertical. The lode varies in size from 1ft. to 5ft. in thickness, giving an average width of from 3ft. to 4ft. Two drives have been driven N. and S. from the bottom, each being about 60ft. In the S. drive the lode is pinched and broken; but, as the country rock is not hard, if the drive is continued the lode will probably make again to its usual size. The N. drive shows a solid body of stone fully 4ft. wide, with well-defined walls. Above this drive stoping has been commenced, the lode being 5ft. wide, strongly iron-stained, and of a very favorable character, gold being seen as work is continued. Fabian's shaft has been sunk to the depth of 150ft., or below water-level, the lode from the surface down to 100ft. averaging from 2ft. to 2ft. 6in. wide. At this point the lode was apparently left on the W. side, and the shaft continued in country rock. In the shaft bottom two crosscuts have been driven E. and W., each about 30ft. in length. The W. one has exposed a vein of stone 12in. wide, which probably is a continuation of the lode above. At present there is nothing of any particular importance exposed in the E. crosscut beyond a few small seams traversing the country rock. Driving S. at the time of my visit was also started at the 80ft. level. The ore from the surface down is in places very rich, the gold apparently making in shoots one below the other. McKechnie's shaft has reached the depth of 50ft., the lode averaging fully 4ft. wide, being strong, well defined, with clean and unbroken walls, and at the present level giving every indication of continuing in depth. The lode matter raised shows gold freely, and is of good average value. McKechnie's tunnel has been started from the surface level of McKechnie's shaft, and advanced 60ft. N. on the same lode, disclosing similar gold-bearing matter for the first 40ft. At this point it became broken, and the face shows at present only a small seam or track of the lode. This is probably caused by the lode coming in contact with an extremely hard bar of quartzite, which, when passed through will probably resume its average width. Dedman's tunnel, with the approach, has reached a distance of 120ft. For the first 90ft. lode material of good value has been exposed, ranging from 1ft. to 2ft. wide. Beyond this point the lode has pinched similar to McKechnie's tunnel, and doubtless from the same cause, as the face is apparently in the same dense hard rock that probably will not continue for any great distance. In the higher portion of the property a main shaft, 10ft. by 4ft. in the clear, has been started and sunk 25ft. This will eventually be connected with McKechnie's tunnel, and all stone raised from each tunnel, also Fabian's and McKechnie's shafts and other lodes which may be opened up, will be brought by tramline to the shaft, hauled to the surface, and from thence trucked to the battery. On the mine there has been erected a 10-stamp mill, rockbreaker, and the usual gold-saving appliances. Surface tramlines from the tunnels and the two shafts mentioned—Fabian's and McKechnie's—have been completed, and shortly should be connected with the main shaft. It is contemplated to erect a tramline from the shaft to the orebins in the battery, and this, when completed, will facilitate the transit of ore considerably to what it is at present. On the day of my leaving, a formation was being opened up about midway between McKechnie's and Dedman's tunnel. There was not sufficient done to determine its width, but it was apparently from 5ft. to 6ft. wide, showing gold freely, and appeared a most important development (known afterwards as Minnis' reef). Judging from surface indications and the numerous outcrops crossing the quartzite formation, there will be other lodes and veins of equal value discovered to those now being worked, and which give every promise of returning good regular returns. (I.M.R., 29-7-01.)

A further report from the Government Geologist, dated February 25th, 1902, was published in April, 1902:—The Blocks battery commenced crushing on May 16th, 1901, and up to March 31st, 1902, had treated 1,695 tons of stone for 5,990ozs. of gold bullion. The stone treated was taken from Fabian's, Ward's, McKechnie's, and Minnis's reefs. The tailings have an average assay value of 7½dwts. per ton.

In all, so far, 32 auriferous reefs have been found on the property. The principal ones prospected and worked are Fabian's, Ward's, McKechnie's, Minnis's, Sullivan's, and the Gully reefs.

Sullivan's Reef strikes 345° ; dip practically vertical. The shaft is now 113ft., with a drive of 12ft. N. along the lode, which varies in thickness from 1ft. near the surface to 1ft. 9in. at 93ft., and 1ft. 6in. at the bottom. The lode carried gold all down, and frequently rich specimens were disclosed. This should prove a valuable and permanent lode when developed.

Ward's Reef.—This is a large and well-defined lode in sandstone and slate country. It strikes 15° , and dips slightly to the E. The outcrop can be traced for some distance on the surface S. A shaft has been sunk to a depth of 86ft., with drives 102ft. N. and 67ft. S. from the bottom along the course. The lode is a large one, being 6ft. thick in the N. face of the drive, and 10ft. at a point between this and the shaft; it is composed of quartz and soft ferruginous and argillaceous formation. At the S. drive the lode is smaller, 2ft. 6in., but is richer in gold. Some stoping has been done here, and a winze sunk 20ft. from the end of the drive, on a rich shoot of gold. In sinking the shaft, and throughout the workings, gold has been found to exist in payable quantities. This is a large, well-defined, and permanent lode, with every probability of increasing in value.

Dedman's Reef.—This lode outcrops on the side of a steep hill, where rich specimens of gold, in some cases associated with native silver, were found. The lode strikes 324° , and a tunnel has been driven 150ft. along it into the hill. Its greatest width, 4ft., was at 109ft. At 135ft. it pinched out, and at the end of the tunnel it is now 10in. wide, and consists of gold-bearing quartz. The stone has been of good quality throughout. This is also a good and promising lode, and has every appearance of permanency.

Minnis' Reef.—This lode has been worked by means of an open cut and a tunnel in the side of a steep hill. The lode formation, averaging 6ft. between the walls, consists of quartz veins and hard quartzite, in both of which rich gold was found. At the present face of the tunnel, 28ft., the vein of gold-bearing quartz is 18in. wide. So far only surface work has been done on this large and newly-found lode, and the indications are in favor of its becoming more regular and better defined in depth.

Gully Reef.—This lode is W. of and approximately parallel to Fabian's reef. At 30ft. in depth the lode is 18ft. wide, consists of ferruginous quartz carrying gold, and has a slight dip to the W. It has been worked along the surface strike for 30ft., and yielded good stone.

McKechnie's Reef.—This lode has a general strike of 334° , and dips to the E. from 76° to 80° . It traverses the quartzose sandstone, quartzite, and slaty strata of the range approximately at right angles. It has been worked by two shafts, a tunnel, and an open cut on the lode. The first shaft, now about 100ft. deep, shows strong and clearly-defined walls about 4ft. apart. The lode is composed of quartz, ferruginous quartz, and a quartzose, siliceous, and argillaceous formation. This shaft, which follows the lode, has carried gold throughout, with occasional very rich patches. The only stone removed for treatment so far has been taken from the tunnel and open cut. This tunnel has been driven into the hill along the lode at the level of the top of the shaft for 150ft. The lode was found to pinch at the hard bars of country rock, as is usually the case, but furnished a supply of good stone for treatment. Rich specimens frequently occurred. This is one of the best-defined and most permanent-looking lodes on the property, and is rich in gold. It has already been tested by the shaft to a depth of 100ft. below the present level of the main shaft.

Fabian's Reef.—This lode has a strike of 340° . The shaft is vertical for the first 20ft., thence to 80ft. on a steep W. underlie, the shaft was continued vertically through hard quartzite. Rich gold was found from surface to 10ft., from 55ft. to 60ft., and from 74ft. to 80ft., the intervening portions of the lode carrying gold of

a lower grade. At 80ft. the lode was cut off by a slide dipping about 40° to the S., and at this level a drive along the lode was put in 41ft. S. on a rich shoot of gold. At 110ft. a crosscut was carried 10ft. E., and thence S. 40ft., striking the slide and lode, which was found to be 3ft. 6in. wide and rich in gold. This stone has been stoped up to the 80ft. level, and thence N. along the slide to the surface 150ft. N. of the shaft. A quantity of exceedingly rich stone has been removed by stopes from the 110ft. level and the open cut. At the bottom of the shaft, 152ft., crosscuts E. and W. have been made and lode formations struck which have not yet been driven on, nor has it yet been ascertained whether either of them is the continuation of the lode below the slide. The following down of the slide on its S. declination and the exploring for the faulted lode below the slide are works of the greatest importance, as it is most probable that the extreme richness of the shoot of gold is due to the presence of this slide. This lode, so far as worked, has proved most valuable, and establishes a record for South Australia.

General Remarks on the Blocks' Lodes.—The walls of the lodes, in most instances, enclose a considerable width of country rock or formation mixed with and intersected by veins of quartz and ferruginous matter, while main quartz veins or reefs follow the line of lode along one wall or the other, or traverse the body of the formation. The gold is found to occur both in the quartz reefs and in the lateral intersecting veins, being richest, however, in the main quartz body. The quartz occurs in shoots of varying thickness, as also does the gold. So far the dip of these shoots is S., and conforms approximately to the dip of the strata, which consists of alternations of quartzite, quartzose sandstone, siliceous and argillaceous slate and sandstone. The lodes have been found to be auriferous in all the varieties of strata, which they cut through and across at angles more or less approaching right angles, and they dip at a high angle, in some cases towards and in others away from each other, leading to the inference that some will intersect or coalesce in depth.

In order to mine these rich bodies economically and to advantage, deep sinking is absolutely necessary, and should be taken in hand with the greatest confidence on the part of the proprietors.

These lodes cover a surface distance of a quarter of a mile from E. to W., and form a compact group for working. The other reefs on the property have not yet been tested and explored. (G.G., 25-2-02.)

Departmental report, by L. C. E. Gee, June, 1904:—The battery power has been increased from 10 to 20 head of stamps, and the large cyanide plant, consisting of three leaching vats, two agitators, three distributing, and four solution vats, with necessary appliances, is now completed, and is capable of treating 750 tons of tailings per month. *Ward's reef.*—About 300ft. S. of the original shaft an underlie shaft starts, and has been worked S. along the reef to a depth of 270ft. on an angle of 40° , which is the dip of the strata S. For a time the main battery supplies came from this source, and at the present bottom the reef shows about 4ft. wide, and is estimated to be worth about 15dwts. per ton. The original shaft has been carried down to 180ft. vertical, and at the bottom a drive has been made S. along the reef for 400ft., about another 100ft. will connect with the underlie shaft; also from this level a crosscut of 300ft. E. connects with the workings on Fabian's reef at the 150ft. level. At 300ft. from the shaft S. along the drive a rise is in progress, now up 135ft., which will connect with the underlie shaft, and open out a large block of reef for stoping. At 280ft. S. from the shaft a crosscut has been started W., with a view of intersecting Sullivan's reef. At 170ft. S. from the shaft a winze was put down 50ft.; the formation at the bottom, 2ft. wide, is highly mineralised and carries veins of quartz. A drive has been started N. from the bottom of the shaft along the reef, now in 30ft., and showing about 2ft. 6in. of reef in the face; this drive is expected soon to intersect the slate gold-carrying bodies known to exist in the N. portion of the Blocks property, and also in the adjoining properties. *Sullivan's Reef.*—The shaft has not been further worked in, but the reef has been exposed on the surface and tested, in some places to a depth of 12ft., for 350ft. N. from the

shaft. The stone raised averaged about 1oz. to the ton in the battery, and it is proposed to work this reef from the crosscut from Ward's. *Fabian's Reef*.—Investigations showed that this reef has been faulted for a distance of 40ft. to the W.; this has taken place in a series of three breaks, the first being found 4ft. to the W. of the reef above the slide, the vertical section being about 10ft.; then a further break of 1ft., with a vertical section of about 15ft.; then a third break of 35ft., and from this the reef appears to be continuous vertically. A main underlie shaft was started near the top of the hill, 25ft. higher than the battery floor, and is being sunk a little to the E. of the reef, on the same angle as the dip of the strata, viz., 40°. This shaft has now reached a depth of 400ft., being about 200ft. below the surface at its present end, where sinking is in progress, and will be maintained. From this shaft three levels have been opened out, at 80ft., 110ft., and 150ft. vertical, and stoping is in progress at each. The stone being taken by the tramline up the shaft direct to the battery is raised throughout the stopes, the whole of the reef being taken out, and the stopes then mullocked up. The reef averages 1ft. 6in., and is mainly composed of ferruginous gossany quartz. It is worth a little over 1oz. to the ton by battery, with about 5dwts. or 6dwts. in the tailings. The rich patches for which this reef has been so celebrated in the past may also be reasonably expected to occur in some degree in the future; and, indeed, during my visit I saw some very rich stone taken from the bottom of the winze 60ft. below the 150ft. level. At a depth of 360ft. along the underlie shaft the reef was broken across to; it is 4ft. to the W. of the shaft, is 1ft. 6in. thick, and carries nice gold. *McKechnie's Reef*.—Stoping is in progress N. and S. from the shaft; the reef averages 2ft. in width, and is worth about 15dwts per. ton. A crosscut of 130ft. connects this reef with Fabian's at the 150ft. level, and underground communication is established from McKechnie's on the E. to Ward's on the W., a distance of 430ft. This will be further extended by the crosscut now in progress from Ward's to Sullivan's. A rise is in progress from the end of the crosscut to connect with McKechnie's tunnel, by means of which a large block of ground on this reef will be made available for stoping. *Minnis' Reef*.—The original shaft was sunk to a depth of about 60ft., and recently, at 20ft. down, the reef was followed on the underlie of a bed of slate, 40° to a depth of 80ft. The reef is about 1ft. 6in. thick, and carries good gold. *Gully Reef*.—This, in the manager's opinion, is Fabian's reef, and will shortly be connected by a drive from Fabian's at the 150ft. level. *Dedman's Reef*.—Nothing further has been done, work being concentrated on the reefs in the vicinity of the battery. Extensive work is in progress at Fabian's main underlie shaft. A large winding plant, with poppet head 40ft. high, is in course of erection; with a 200-ton ore bin, and a rock-breaker, which will be worked by the small winding engine now in use at the shaft hauling the automatic tipping truck. A tram has been made from the shaft to the battery, and the ore will be broken at the shaft and thence trucked to the battery bin, whence it will be fed to the battery by automatic feeders. There is a winding plant at Ward's shaft, which is used for unwatering the mine; this shaft is also the sole point of ingress and egress of the workmen employed underground. Work is at present practically concentrated on the portion of the property between Sullivan's and McKechnie's reefs, forming a compact group of reefs which can all be worked from the one main shaft. More water is required for boiler purposes, but water increases as the main shaft is deepened, and more condensers have been erected. An electric drilling and lighting plant is on the mine, but it is not in use at present. There is a large quantity of ore in sight, and further ground for stoping is being steadily and systematically opened up. All indications point to permanence and prosperity; 119 persons are at present employed on the mine. (D.R. (Gee), 14-6-04.)

From the starting of the Tarcoola Blocks Company's battery, May 16th, 1901, to June 30th, 1907, 26,719 tons of ore, yielding 34,435ozs. 15dwts. 16grs.—1,772ozs. 18dwts. 11grs. had been obtained from the cyanide plant—making a total of 36,208ozs. 14dwts. 3grs., valued at £112,355; the stone being worth (by battery treatment

only) 78s. per ton. It has been found necessary to discontinue crushing until the new main shaft (a continuation of what was known as the *Gully Shaft*) has been sunk to a proper depth, and work at the present time is confined to sinking this shaft, extending the E. crosscut at No. 3 level, and the extraction of some good stone on McKechmie's W. lode. During the year 1906-7 4,047 tons have been crushed for 4,178ozs., or 1oz. 0dwts. 26grs. per ton—122ozs. have been obtained from cyanide—the total value being estimated at £13,035. (Review of year 1906-7.)

Curdnatta (lease No. 1124).—Adjoins the Government reserve. Several small trial pits have been opened and one shaft sunk 30ft., the latter disclosing lode matter from 12in. to 18in. wide, and all carrying gold to a more or less extent. (I.M.R., 29-7-01.)

A prospecting venture, started by Port Augusta residents, who sent a small prospecting party to Tarcoola soon after the discovery at the Blocks Mine, and the block (1124) upon which the Curdnatta Mine is now situated was pegged out in May, 1900. The company holds six leases—1121 near Brown's Hill, 1124 adjoining the Government Reserve, and 1132, 1133, 1162, and 1163, E. of the Victory. The workings on lease 1124 consist of No. 1 shaft, sunk on a N. and S. vein of ironstone and quartz to a depth of 28ft. This stone only gave a trace of gold. No. 2 shaft, situated 2½ chains E. of No. 1, sunk in another vein of ironstone and quartz to a depth of 16ft. This stone dollied well, and gave assays up to 3ozs. 14dwts. per ton. No. 3 shaft, on the S. boundary of this lease and adjoining the Government Mine, sunk to a depth of 40ft., on a ferruginous and argillaceous lode body, containing quartz, and which averages 2ft. in width; thence the lode is driven on N.; the country rock is granite. Thirty tons from this shaft, treated at the Tarcoola Government Battery in November, 1901, gave a return of 1oz. 13dwts. 1gr. per ton. Seventy tons treated in March, 1902, gave 87ozs. 18dwts. 24grs. No. 4 shaft, situate 250ft. N. of No. 3 shaft, has been sunk on the same lode to a depth of 80ft.; this lode shows gold and is large and mullocky; it strikes nearly N. and S. and dips to the W.; drives are in progress from the bottom of this shaft. *Vide* remarks concerning this lode under heading "Government Mine." No. 5 shaft has been started 150ft. N. of No. 4, on the same lode; the stone also shows gold. An air shaft sunk on the lode between Nos. 3 and 4 shafts showed free gold in the stone. Lease 1133—A shaft was sunk 58ft., at which depth salt water was met with on a large quartz body, which strikes E. and W. and underlies S. At the bottom the lode appears about 12ft. between the walls. On leases 1162 and 1163 some prospecting has been done by shallow costeans and pits, but with no result so far. No work has been done on 1121. (Government Geologist, 25-2-02.)

The air shaft (lease 1124), now called No. 2 shaft, has been sunk to a depth of 110ft., passing, at 94ft., through a rich shoot of gold in gossany quartz. Fresh water was struck at the bottom of this shaft, which is sunk on the underlie of the reef. Two open cuts between the shafts have been made along the reef; No. 2 cut has been mullocked up, and the central portion carried on as a shaft, down 44ft. (11-12-02), in stone, showing gold. The mining done during the year consisted of grubbing out surface stone for the battery.

The total quantity of stone from this mine treated at the Tarcoola Government Battery and Cyanide Works up to June 30th, 1907, is 315 tons 1cwt., for 460ozs. 4dwts. gold bullion, valued at £1,691 1s. 5d., the stone being worth 108s. per ton.

Dark Hill, Tarcoola.—Adjoining Birstow's, and the principal work has been the sinking of three shafts. No. 1 is 60ft. from the surface, the lode formation averaging 3ft. wide, consisting of intrusive rock intersected by small quartz veins strongly iron-stained and containing fine gold. No. 2 shaft is at present 66ft. deep, the lode formation from wall to wall being 4ft. wide, with from 6in. to 12in. of broken lode matter containing gold on the footwall side, the remainder of the formation being country rock of little or no value. The walls are regular and well defined, and have every appearance of continuing down. No. 3 shaft has been sunk 15ft. in broken material composed of country rock and small quartz seams, which may improve as depth is attained. At present it is not well defined. (I.M.R., 29-2-02.)

Surveyed sections 901-5, situated at Dark Hill, about 7 miles S. of W. of Tarcoola. The ground was originally prospected by Schneider and Lyall, who found gold in quartz, ironstone, and slate. They disposed of the blocks to a syndicate formed in Port Pirie. No. 1 shaft, section 903—Sunk on a small surface outcrop of quartz and iron 23ft. vertical, thence 17ft. on the W. underlie, then 31ft. on S. dip from the end of the vertical portion (23ft.) along a slide of country. Gold was obtained from the quartz and ironstone throughout these workings; but, the shaft being difficult to work, owing to the twisted nature of the reef, operations in it were suspended, and a start made at No. 2 shaft, situate about the centre of section 903. This shaft, on two formations which were picked up by a costean pit, was sunk on a flat W. underlie to a depth of 159ft. The country was unsettled, and the metal-carrying vein about 1ft. wide; at 34ft., 54ft., and 117ft. in the shaft free gold was seen. The reef, which at 66ft. was compact and nearly 4ft. wide, split up into small veins. The shaft was continued on as a water shaft, and a small supply of fresh water struck at 159ft. No. 3 shaft, section 903—This was started for a main shaft and sunk vertically. At 34ft. a lode of quartz and ironstone, 3ft. 8in. between the walls, was struck, dipping to the W. It showed free gold and dollied well. The shaft was continued to 104ft., and at 100ft. level a crosscut W. was made, which at 37ft. struck the above reef, about 4ft. 6in. from wall to wall, and showing fine gold by dolly. No. 4 shaft, on section 902—A vein of quartz and ironstone was discovered by a costean pit; free gold was seen, and good results obtained by dolly. A vertical shaft was started; the vein, 2ft. wide, is vertical for 15ft.; thence a slight underlie E.; thence it underlies more sharply to the E. and passes out of the shaft. It is proposed to continue the shaft and crosscut E. for the reef. The country rock here consists of metamorphic slate with intruded dykes of diorite, decomposed amygdaloidal rock, and granite, causing the strata to be faulted and disjointed, and the veins to be broken and intermittent. Twelve tons treated at the Tarcoola Government Battery only gave 2ozs. 12dwts. 8grs. (Government Geologist, 25-2-02.)

The W. shaft, No. 4, has been carried down from 77ft. to 117ft.; the sinking has been on the reef, which at 77ft. was in the shaft, and went down nearly vertical to 105ft., when it is thrown about a foot to the W. by a fault. Below this fault the reef is dipping a little to the W. The reef consists of quartz and ironstone, is about 1ft. thick, and carries a little gold. In carrying down the shaft, the reef was found in places to expand to 4ft., and in others to pinch to 1ft. (8-12-02.)

Dark Hill (Bairstow's).—Situated on a low range known as Dark Hill, about 2 miles S.W. from Telmer's Hill. At the time I visited it gold had just been found at a depth of 2ft., in a quartz and ironstone gossan lode having a width of 1ft., striking N. 22° E. Gold was visible in the stone, and the indications were most promising. The rock formations consist of cleaved clayslate and slaty sandstone. Carbonate of bismuth and galena have since been found to occur in the veinstone. At Lyall's lease, on the same hill, quartz and ironstone veins have been prospected, and colors of gold have been found. Since then I have seen specimens of fine gold disseminated through ironstone and black argillaceous rock from this locality. (Government Geologist, 11-7-00.)

An underlie shaft has been sunk to the depth of 77ft., exposing two well-defined clean walls 4ft. apart, with a vein of stone ranging from 2in. to 10in. thick, the remaining portion of the formation being country rock containing small fine seams of pyrites. A second shaft has reached the depth of 50ft. on a siliceous vein from 6in. to 9in. wide. Two bulk samples taken from the ore dumps yielded 11dwts. and 18dwts. of gold per ton respectively, which is encouraging. (I.M.R., 29-7-01.)

Gold was found near the surface in a quartz and ironstone gossan lode, striking N. 22° E., and appeared very promising. The rock formations consist of cleaved claystone and slaty sandstone, with intruded dykes and masses of diorite and granitic rock, which have caused faults and dislocations, and in sinking on this lode it was found that the auriferous veinstone pinched, and was not persistent, although the

walls continued. A large amount of prospecting work has been done to the N. of the shaft, but no continuance of this lode has been disclosed, nor any other auriferous discoveries made so far. Rich finds of gold-bearing stone are frequently made in this class of country, but owing to its disturbed nature and the irregularity of the veins only short shoots of stone can be expected, and prospecting is rendered more difficult and uncertain than in settled country. Twenty and a half tons treated at the Tarcoola Government Battery in March, 1902, yielded only 3ozs. 2dwts. 21grs., and the blocks were abandoned. (Government Geologist, 25-2-02.)

Excelsior.—Leases 1071 and 1187, N. of the Mauser Rock. On the former lease an ironstone lode carrying a little gold was found by surface prospecting, and a shaft was sunk a little to the E. in a large formation enclosed in well-defined granite walls. This did not carry any gold, and at 20ft. vertical the ironstone lode was met with, striking N. and S., and dipping to the E. at 45°. This has been followed down on the underlie for about 70ft., making 90ft. from the brace. The lode consists of ironstone and quartz. Nice colors of gold are seen in the stone, and chlorite also occurs in the lode. The shaft is entirely in lode matter, the granite footwall being followed, and the hanging-wall is not disclosed, and at the bottom the lode appears to be taking a sharp dip downwards. Surface prospecting has disclosed other lodes, apparently of a similar nature, on this block. A little costeaning has been done on lease 1187. (Government Geologist, 25-2-02.)

Ten tons of stone from lease 1071 were treated at the Government battery, but only yielded 15dwts. 6grs. of gold. Another shaft sunk 40ft., but only colors of gold were found. (8-12-02.)

Federal.—The Federal Mine, besides several openings, has been worked by two shafts. The open cutting, or prospecting shaft, has reached the depth of 49ft. At 15ft. from the surface the lode proved from 10ft. to 11ft. wide, exposing very good stone, samples taken ranging from 1oz. up to 6ozs. per ton. Below this point the lode narrowed considerably, also lessened in value, which I think is chiefly accounted for by the broken and disturbed nature of the country rock, which at this particular point shows indications of faults that may not appear at the deeper level. The second or main shaft is 50ft. E.; present depth, 92ft. A crosscut has been driven W. 15ft. for the purpose of cutting the lode at a deeper level, where the country rock will probably become more settled and the lode more regular and defined. (I.M.R., 29-7-01.)

Gold leases 1126, 1125, 1106, 1154, 1095, and 1032, situated on the N. side of the Tarcoola Range. The workings are on lease 1126, where gold was found on the surface in a large ferruginous granite formation containing quartz. An open cut was made which disclosed a face 11ft. wide. One and a half tons of stone from this place, treated at the Petersburg Government Battery, yielded 1½ozs. of gold per ton. This formation, which appears to strike nearly E. and W., with a slight underlie to the N., was followed down to 52ft., when the gold contents became poor; the lode was tested by drives in several places to the E. with no better results. A main vertical shaft was started 40ft. to the E. and sunk to a depth of 92ft.; from the bottom a crosscut was made 36ft. S., entering at 25ft. a lode formation carrying a little gold. A drive was then made from the 92ft. W., 30ft. through slate and quartzite, thence drove 40ft. S.; at 15ft. along this drive entered hard close-grained quartz rock carrying a little gold and extending to 21ft., thence into a ferruginous formation consisting of quartz, kaolin, ironstone, &c. Gold was seen in this to 31ft., when the drive entered granulite. This large formation was driven on W., and the original shaft was connected with this drive by a crosscut to the S. from the 52ft. for 20ft. and a winze at the end of the same, thus giving perfect ventilation throughout the workings. Twenty-five tons from the large formation treated at the Government battery, Tarcoola, gave only 1dwt. 6grs. per ton. This was a great disappointment, as at least ½oz. per ton had been confidently anticipated, and the company at once suspended operations. (Government Geologist, 25-2-02.)

Great Tarcoola.—In this property a shaft has been sunk 50ft., chiefly in quartzite, with lode formation consisting of quartz showing on the footwall side. It is intended to sink to the 60ft. level, then crosscut through the lode to ascertain its full width and value. I was informed a small parcel had been sent away and yielded an average of 11dwts. per ton. (I.M.R., 29-7-01.)

Gold leases 1042 and 1043—These blocks were pegged out in May, 1900; they adjoin the Government reserve on the E. and form part of a broad valley between two low ranges. The ground showed no outcrop nor any surface indications. Numerous costeans were sunk on the blocks, but nothing of importance disclosed; and finally work was discontinued upon them and lease No. 1041 acquired. This ground adjoins the Enterprise E. block to the N. A quartz reef showing occasional free gold has been opened to a shallow depth, and the operations of the company consisted of sinking a shaft to a depth of 50ft., thence driving N. along the reef; it was found to be much disturbed and heavily charged with pyrites, from which a little gold could be obtained by washing after calcination; the country being very hard and progress slow and expensive, work was abandoned. (Government Geologist, 25-2-02.)

Government Mine.—A shaft is being sunk on the reserve with the object of obtaining water for the Government battery and developing the lode which is known to pass through the property. The vein is at present from 15in. to 18in. wide, and shows gold freely, the strike being about N. and S., with a slight W. underlie. (I.M.R. 29-7-01.)

The mine worked by the Government at Tarcoola is situated on the E. portion of the Government reserve, and was pegged out on behalf of the Public Trustee in May, 1900. Surface stone showing gold was found and a shaft commenced. This disclosed a gold-bearing lode, strike 14° ; the shaft proved the lode to be vertical for 31ft.; thence inclined W. to about 50ft., and thence running nearly vertical to 80ft., when fresh water was struck. The walls at 50ft. are 3ft. 6in. apart, with a narrow vein on the W. side, which carries gold from the surface. The lode consists of quartz and ferruginous and argillaceous material, traversing granitic rock; near the surface it was ill-defined and varied from 2ft. to 2ft. 6in. in thickness. At the present depth, 80ft., drives are in progress N. and S. along the lode, which averaged 2ft. in width in the N. and 5in. in the S., and gave good prospects. This lode, which is identical with that in the Curdnatta Mine, adjoining on the N., has been proved auriferous for a distance of 560ft. along its course (including 400ft. in the Curdnatta lease, 1124), and to a depth of 80ft., which is water-level. It is fairly well defined as regards walls, and, although pinching in places, as sunk and driven on maintains a fairly workable width. The shoots of gold should be found to continue in depth; the prospects of the whole lode are good, and therefore the sinking of shafts to test it at deeper levels is fully warranted. These remarks apply also to the Curdnatta Mine. Twenty tons from the shafts, treated in November, 1901, yielded a total of 73ozs. 16dwts. 5grs. of gold (3ozs. 13dwts. 19grs. per ton), valued at £239 5s. 1d. Twenty-five tons treated in February, 1902, yielded 29ozs. 14dwts. of gold by battery, with 7dwts. 3grs. in the tailings. Five tons treated in March yielded 66ozs. 15dwts. 3grs.

Total ore treated up to June 30th, 1907, 243 tons for 773ozs. 6dwts. 1gr. gold bullion, valued at £2,532 8s., the stone being worth 208s. per ton.

Kychering Hills.—A quartzite and sandstone range stretches W. some 4 miles from Kychering Soakage (about 20 miles W. of Tarcoola), near which place it abuts on the granite. Colors of gold were obtained in ironstone and quartz, and also a color from the alluvial wash. The locality has since been tried, and alluvial gold discovered by a party of three prospectors, who, owing to scarcity of water near their workings, used the dry-blowing process. Several excavations have been made by them at the W. end of the range, from which they have obtained a few pennyweights of slightly waterworn gold. Attention has also been paid to the quartz reefs in the same neighborhood. Owing to the detritus being usually

cemented by travertine limestone, the sinking for alluvial gold is very hard; this is a great drawback to prospectors. Four or 5 miles S.E. from Kychering there are some low hills of quartzite capped by jasper rock which are worthy of examination. (Government Geologist, 11-1-01.)

Lease 1060.—Some rich gold specimens were found here in a vein of ironstone and quartz traversing the granitic rock. The shoot of gold seems to have been lost, for further exploration failed to disclose anything of importance. (Government Geologist, 25-2-02.)

North-Western Prospecting Association (Tarcoola).—Main shaft has reached the depth of 150ft., and a crosscut is now being driven W.; face at present 45ft. from shaft. Country rock is a kaolinised material. Another shaft further W. has been sunk 82ft. At the 38ft. level a crosscut has been extended E. 60ft. Other prospecting work, such as trial pits and cross trenches, has been done. (I.M.R., 29-7-01.)

Gold leases Nos. 1000, 1001, and 1239, situated S. of the Tarcoola Range. These blocks were pegged out on behalf of the above syndicate in April, 1900, and mining operations were started a few months later and continued intermittently until June, 1901, when operations were suspended for want of funds. By this time a good deal of useful work had been done, and crosscutting for reefs had been started. No. 1 shaft was down 82ft., with a crosscut 60ft. E., No. 2 16ft., and No. 3 150ft., with a crosscut 52ft. W. The sinking was soft, through kaolinised slate, and a small quantity of salt water was struck in both shafts. The blocks are situated on the S. flat, and the idea of the manager was to pick up the continuance of the reef worked in the Warrigal and Blocks lease 1015. The Government Geologist obtained colors of alluvial gold near a bluff in lease 1001. (Government Geologist, 25-2-02.)

Napperby (Tarcoola).—This property comprises two blocks, on which a shaft has been sunk to the depth of 90ft. Crosscuts are being driven E. and W. to intersect lodes supposed to traverse the property. The country rock is slate, with thin streaks of pyrites of a favorable character. (I.M.R., 29-7-01.)

Gold leases 1180 and 1181, on the N. flat between the Tarcoola Range and Brown's Hill. A prospecting shaft has been sunk to a depth of 124ft. through soft blue slate. From the bottom a crosscut has been extended for 60ft. S.W., passing through similar country intersected by small veins of quartz. At 40ft. in this crosscut a lode consisting of ironstone and quartz was struck. This showed gold by dolly, and an assay gave 4dwts. of gold per ton; 4ft. further on, 44ft. from the shaft, a vein of similar stone 10in. wide was struck. (Government Geologist, 25-2-02.)

Prince Tarcoola.—The Prince Tarcoola adjoins the Tarcoola United, and a shaft is being sunk with the object of striking the Enterprise and Tarcoola United lodes, which, from their strike, should pass through the property. The present depth is 80ft. from the surface, timbered, centred, and ladder-road fixed. It is intended to continue sinking some distance further previous to crosscutting the country. (I.M.R., 29-7-01.)

Gold leases 1096, 1104, and 1105, situated from 35 to 65 chains N. from the Blocks Mine. These blocks are held by a Melbourne and Adelaide company, registered in Melbourne, and were secured by Melbourne investors, with a view of testing the ground on the N. side at a depth. A main shaft, 8ft. by 4ft. in the clear, divided into three compartments, close timbered and frame sets, situated near the boundary between 1096 and 1105, is sunk to 104ft. The sinking was soft, mainly through kaolinised slate. At 40ft. from the surface a bedded formation, consisting of ferruginous quartz, rubble, &c., 2ft. 6in. wide, was met with, the strike being E. and W. and the dip 60° S.; a little gold was obtained by dolly in this. At 98ft. a chamber, 8ft. x 8ft. x 7ft., was put in and crosscutting started. S. 16ft., intersected the above formation about the same; crosscut extended to 46ft.; nothing further struck. Crosscut N. 16ft.; no result. Drives were made along the formation

at 16ft. in the crosscut, E. 100ft., W. 40ft. The formation carries a little gold throughout. This property was worked in conjunction with the Federal, and operations were discontinued at the same time.

Royal May.—Consists of four gold mining leases situated about 3 miles W. of Tarcoola township. Prospecting is in progress near a large N. and S. outcrop of quartz rock, of the same character as the Glory Quayle and Mauser Rocks. A pit near the outcrop has disclosed a body of close-grained greyish quartz carrying pyrites, and in which fine gold is occasionally seen and obtained by dolly. A little to the N. another prospecting pit is sunk on a formation consisting of quartz, slate, and ironstone. Fair prospects of gold have also been obtained here, and further prospecting is advisable. (Government Geologist, 25-2-02.)

A little further desultory prospecting done; no finds beyond colors.

Royal George.—It has been worked by a number of trial pits and cross trenches, but little or no permanent work has been done. In one portion there are two strong quartz outcrops standing well above the surface. Between these a shaft has been started with the intention of proving both formations from the one shaft at a deeper level. There is a considerable quantity of lode croppings scattered on the surface, in some of which gold has been seen; and, doubtless, in time their source will be discovered. (I.M.R., 29-7-01.)

Adjoins the Royal May to the N.W. A shaft has been sunk 60ft. deep on a lode formation 4ft. between the granulite walls, and carrying veins and seams of quartz and ironstone. This strikes N. and S. and dips to the W. Fine gold is visible in the ironstone, and prospects from the borings made in sinking have been good. On the same property there are strong quartz outcrops intersecting and branching from each. The lode sunk on is strong and well defined, and the prospects of its continuance and gold-carrying in depth are good. (Government Geologist, 25-2-02.)

At bottom of shaft drive made for 31ft. S. along the lode. Twenty-two and a half tons of stone were treated at the Government battery and only yielded 2ozs. 1dwt. of gold, valued at £7. There was a considerable quantity of granitic rock included in the parcel. (8-12-02.)

Tarcoola Consols.—Gold leases 1039 and 1040. Situated on the S. flat, S. of and adjoining the Blocks and the Tarcoola South Mines. Two shafts have been sunk to a depth of 65ft. (W.) and 48ft. (E) through plumbaginous clayslate, in which some small veins of quartz were cut. Both shafts are below water-level, a large supply of salt water being obtained at the W. one. Leases 1109, 1110, and 1111 are also held, but no work has been done on them.

These leases have been acquired by the Blocks Company. No further mining work has been done upon them but the W. shaft. Lease 1040 is used as a water shaft by the Blocks Company; an engine and pump have been fixed at it, and water for use at the Blocks battery is obtained from it. (8-12-02.)

Tarcoola Enterprise (Simm's shaft, on gold lease 1020).—This shaft had been sunk 70ft. on a lode, striking N. and dipping W. at a high angle, consisting of quartz with gossan and pyrites, and showing free gold. This lode traverses the granitic rocks. Dykes of basaltic amygdaloidal trap and diorite occur in the vicinity. The indications are favorable to the presence of a strong lode, and show that the lodes traversing the sedimentary rocks continue downwards into the granitic rocks. (Government Geologist, 11-1-01.)

The main shaft has been sunk to the depth of 139ft., following the lode down on a slight underlie to the W., the lode averaging about 4ft. wide, with clean unbroken granite walls. At the 130ft. level two drives have been driven on the course of the lode, N. 56ft. and S. 55ft., each showing the same character of ore and being of similar width. These drives appear to have been driven at the point or level where the oxidized ore gives place to the sulphides. I was informed that from the former a small parcel of some tons was forwarded to the Petersburg Cyanide Works, and yielded over 2ozs. of gold per ton. The lode is very persistent in character, and has a most favorable appearance. Two other shafts are being sunk, one 90ft.

and the other 84ft. in depth, on the supposed strike, of the Tarcoola Blocks lodes; but, at the present stage, these are simply prospecting shafts that will need crosscuts from one to the other to prove their value. (I.M.R., 29-7-01.)

Gold leases 1020, 1021, and 1192, adjoining and N. of the Proprietary Co.'s W. leases. Pegged out in May, 1900, on behalf of the Wilgena Enterprise Co. (Earea Dam). Work was started on lease 1020; a shaft, known as Simms' shaft, sunk on a N. and S. quartz reef. This has been gradually continued, and is now 200ft. deep. At 45ft. the stone assayed 8dwts. per ton; at 72ft. rich gold specimens were struck, and at 130ft. water-level was reached, and the lode, 4ft. wide, changed to sulphide. Drives were made N. and S. along the lode at 132ft. At the N. end a crosscut was made in siliceous slate, with quartz and pyrites veins showing, also galena; the lode is enclosed in coarse granitic walls, and this is apparently a "horse" of metamorphic rock in the granite. In March, 1901, 2 tons 12cwts. of ore from the shaft, treated at Petersburg Government Battery, returned 2ozs. 18dwts. per ton; in December, 1901, 24 tons from the same shaft, sulphide and oxidised ore, treated at the Government battery, Tarcoola, yielded a total of 27ozs. 4dwts. 15grs. The lode strikes nearly N. and S.; it has a slight underlie at first to the W. and afterwards to the E. The lode is in the granitic rock underlying the sedimentary formations in which the Blocks lodes appear. The lode is strong and permanent-looking, and has been sunk on and proved to the greatest depth, 200ft., of any on the field so far, and it has every prospect of developing into a permanent and payable mine.

Stirling's shaft, vertical, lease 1021, sunk to 82ft.; Broadbent's shaft, vertical, on the E. side of lease 1021, sunk to 92ft. These shafts are 400ft. apart, and it is intended to prospect the intervening and surrounding country from them. (Government Geologist, 25-2-02.)

Stone was stoped from 130ft. and 150ft. levels in Simm's shaft, but the battery results of various small parcels were not payable; the sulphide ore not containing gold equal to assays obtained.

A drive S. along reef from 200ft. level in Simm's shaft in search of shoot of gold found at 130ft. and 150ft. was not successful. The water in this shaft had increased considerably, and the company was wound up early in 1903. Total quantity of ore treated, 104 tons 5cwts. for 96ozs. 12dwts. 3grs. of gold bullion, valued at £320 10s. 10d.; stone worth 61½s. per ton.

Tarcoola Main Reef.—Five gold mining leases, 1101-3, 1035-6. Shaft sunk on lease 1102 to 104ft., through brownish slate, close timbered. At 96ft. drives were opened out E. 12ft. W. 14ft. Nothing struck but small ferruginous veins, both in driving and sinking. On lease 1036 a shaft was sunk to 50ft. on a large lode formation, consisting mainly of ironstone and quartz. This strikes N. and S., and can be traced for some distance on the surface; it was found to carry a little gold. Near the boundary line between 1103 and 1036 another lode formation outcrops; it strikes N.E., and is about 3ft. wide. An open cut has been made 10ft. along the lode and 10ft. deep. The stone is heavily charged with pyrites, but so far gold has not been found in it. (Government Geologist, 25-2-02.)

Tarcoola North.—This holding has been prospected by sinking shafts to various depths and driving crosscuts. No. 1 shaft is 135ft. deep, and has crosscuts driven at the 57ft. and 100ft. levels, the country rock being chiefly sandstone with bars of quartzite. No. 2 shaft is 66ft. from surface, a small vein of quartz and iron 3in. wide, carrying fine colors of gold. No. 4 shaft is at present 51ft. deep, the material being decomposed felspar with boulders of quartzite, almost having the appearance of alluvial wash. No. 5 shaft is 50ft. in depth. There is also a considerable amount of crosscutting and trial pits made throughout the property. (I.M.R., 29-7-01.)

Gold leases 1045, 1046, and 1047.—Situated on the N. side of the W. end of the Tarcoola Range, pegged out in June, 1900, on behalf of the Warburton Syndicate, then working claims at Earea Dam. A company was formed, mainly in Port Adelaide, and up to August, 1901, when operations were suspended, the following

work had been done :—No. 1 shaft, on lease 1046, sunk to a depth of 135ft. Started on a large outcrop of quartz charged with pyrites, strike N. and S., with a dip to the W. At 27ft. the stone assayed up to 1oz. of gold per ton. At 57ft. a crosscut was put in 37ft. W. without reaching the lode. At 101ft. a crosscut W. was made for 26ft. through quartzite and slate in bands. Colors of gold were obtained by dolly from this crosscut. Salt water was struck at 130ft. The rock is sandstone with veins of ironstone. No. 2 shaft, lease 1045, sunk on a 2ft. vein of quartz containing pyrites and gossan, which was found by costeaning. Country rock granite. At 30ft. the vein passed out of the shaft to the W. Shaft was continued to 66ft., and a crosscut for 19ft. E. gave no result. A crosscut W. at 18ft. struck a leader 3in. wide, in sandstone. This showed a little gold by dolly, and was driven on S. 30ft. and N. 13ft., but the stone did not improve. A winze was sunk for 18ft., and the leader found to cut out. The crosscut was continued for 14ft., making 32ft. in all. Shaft No. 3, lease 1045, is a prospecting pit 10ft. deep. Shaft No. 4, lease 1045, sunk 50ft. through alluvial boulder drift wash and granite bottom. Drove along the bottom W. for 79ft., when the bottom dipped sharply to the W. Drove E. 30ft. through granite; these workings were in search of a lode outcropping on blocks 957 and 1012. No. 5 is a shaft 51ft. deep, sunk on the E. boundary of lease 1046, with the intention of cutting Simms' reef in the Enterprise, but is out of position. As there is a possibility of alluvial gold existing, it would be well to continue the inclined drive W. from No. 4 shaft in order to test the deeper ground. This boulder drift has been derived from the denudation of the surrounding country, and it is reasonable to suppose that portions of the deeper ground will contain gold. (Government Geologist, 25-2-02.)

A new shaft was sunk to the N.W. of No. 4 shaft, on lease 1045. It passed through boulder wash for a depth of 98ft., when it bottomed on the granite, still dipping to the W., through which, at the bottom of the shaft, runs a N. and S. quartz vein about 18in. thick, and carrying a little gold; this on being followed down, at 102ft., gave place to dense galena; and at 108ft., the bottom of the shaft, the vein, which is dipping vertically, is from 18in. to 2ft. wide, and assays 57 per cent. of lead, with a little silver and a trace of gold. This find, though not of much commercial value at present, is yet of considerable interest and importance as demonstrating the wide mineral possibilities of the district. In the search for alluvial, for which the shaft was sunk, a drive has been made W. along the granite bottom for 40ft., thence 18ft. N.W.; the bottom continues to dip sharply to the N.W. (8-11-02.)

Tarcoola Proprietary.—This property comprises a large number of gold leases, situated in various parts of the field. At present the chief work is being done on leases Nos. 951, 952, and 953, N. of and adjoining the Tarcoola Blocks. On these the principal work has been the sinking of six shafts, ranging in depth from 30ft. to 102ft., and crosscuts driven with the object of eventually connecting the various shafts and thoroughly testing the property. The W. shaft is supposed to be near the line of Sullivan's lode; present depth is 30ft. and crosscut driven 18ft. From surface bearings, should the crosscut be continued, the lode should be intersected within a very short distance; but from the character of the rock, which is a decomposed slate and sandstone, the crosscut will probably not be of sufficient depth to strike the solid portion of the reef. No. 1 shaft has been sunk to the level of 59ft., some distance E. of Sullivan's line of lode, and a crosscut has been driven 18ft., passing through vein formation from 15in. to 18in. wide, being in the bottom of the crosscut slightly larger than at the top. This apparently is one of the numerous veins not previously prospected, and, from surface appearances, if the crosscut is continued W. other veins will be intersected. The country rock is chiefly clayslate with bands of quartzite. No. 2 shaft is still further E., and is at present 112ft. from surface. It is supposed to be on Ward's line of lode; but, until further developments are accomplished, that point will remain undetermined. Down to the 65ft. level the lode was cut through in places, showing 12in. to 15in. wide. At the bottom a crosscut is driven, passing through the formation 4ft.

thick, with about 18in. of solid stone of a favorable character. No. 3 shaft has been sunk to intersect lodes known to exist E. of McKechnie's; present depth 68ft. from surface. A crosscut has been driven 46ft. W. At 20ft. from shaft a vein of quartz 15in. wide was passed through, and the crosscut will be continued another 50ft. and connected with the workings from No. 2. No. 4 shaft has reached the depth of 72ft. and crosscut driven E. 48ft. At 36ft. from shaft a strong formation was encountered, consisting of quartzite, quartz, and slate for about 8ft. wide, not well defined, but found by prospects to contain gold, and requiring further exploration to test its value. A crosscut has also been driven W. 24ft., and it is intended to connect this with the No. 3 shaft, to complete the system of crosscutting from one shaft to the other. No. 5 shaft has been sunk to the depth of 102ft. and crosscuts driven E. and W. The W. crosscut is 95ft. from shaft, passing through several seams and leaders of quartz material containing pyrites; but as yet nothing defined. This crosscut should be extended with the object of cutting lodes or veins which appear on the surface about 30ft. further W. The E. crosscut has been advanced 25ft., which is not a sufficient distance to ascertain if the vein on the surface continues down or not, consequently it should be continued. The position of this property is good, and the mode of prospecting, under the circumstances, is the best that can be adopted. It consists in sinking the shafts to the same underground level and connecting each by crosscuts driven one from the other. By this means the continuation of any lodes or veins that may pass through the property will be intersected. The character of the country rock is favorable, being slate, sandstone, and quartzite bars. (I.M.R., 29-7-01.)

As stated in the introductory remarks, the three syndicates first formed in connection with Tarcoola, viz., the Gawler, the Glory Quayle, and the Wilgena West amalgamated, and formed two companies—the Proprietary and the Associated. The Proprietary holding consists of 17 20-acre leases, viz., Nos. 912, 913, 951, 952, 953, 935, 936, 937, 938, and 959, situated on the crown of the Tarcoola Range, and Nos. 940, 941, 960, 1203, 1205, and 1206, situated at the copper locality, about $\frac{1}{2}$ miles N.E. from the township. Mr. Dawes, the original prospector, succeeded in finding gold in several places along the top of the hill. Leases 952 and 953 adjoin the Blocks Company's leases, upon which the rich finds had been made, and upon them several shafts were started with a view of intercepting the Blocks lodes. A shaft was sunk in the S.W. corner of lease 935, in search of the Warrigal lode, to a depth of 84ft. A crosscut W. was afterwards put in from the bottom of this shaft, but no gold-bearing stone was found. An open cut was made through the large rock outcrop in the E. portion of the lease 913, with no good result, and on lease 938 an underlie shaft was sunk 35ft. on a quartz vein, showing occasional colors of gold. At the end of September, 1901, regarding the shafts on 952 and 953 (numbering from the W.), the work stood—No. 1 shaft, sunk by Mr. Piper, 59ft., crosscut extended to No. 2 shaft 156ft. E. and W. 30ft. A lode 4ft. wide was struck 24ft. from shaft in the W. crosscut, and a drive for 28ft. to the S. was made on the course of the same. The lode maintains its size, and is the full width of the shaft, but was found to be poor in gold. At 13ft. in the E. crosscut a lode 18in. wide was struck, and was driven on N. for 16ft., giving occasional colors of gold. A drive was started S. in the same class of stone. At 55ft. in the crosscut a large lode was struck (called No. 2), supposed to be McKechnie's. This is heavily charged with mineral, but gave no gold results by dolly. Drives were commenced N. and S. along the course. At 108ft. from the shaft along the same crosscut a lode (?Ward's) 15in. wide was struck; this showed no gold. No. 2, 112ft.; crosscut to lode E. 5ft., along which drives were extended N. 10ft. and S. 13ft. The lode here averaged 2ft. 6in. in width, and was worth 5dwts. per ton; it consisted of quartz, pyrites, galena, and zinc blende. At 65ft. in the shaft opened out on the lode and drove S. 35ft. Lode similar to the bottom drive, and carrying a little free gold. No. 3 shaft—Crosscut W. at 68ft. connected with No. 2 at 110ft. At 20ft. W. from shaft struck lode 2ft., carrying a little free gold, and estimated as payable by Mr. Piper; drives extended

N. 11ft., S. 15ft. No. 4 shaft deepened from 50ft. to 70ft.; crosscuts extended E. 110ft. and W. 27ft. In the E. crosscut intersected two lodes, at 36ft. and 108ft. from the shaft respectively. The first is 3ft. wide, and was driven on for 13ft. N. and 9ft. S., and a winze sunk to the depth of 15ft. in the N. drive; the lode dillies fairly well, and assayed 2ozs. 12dwts. per ton. The second lode has not been prospected. No. 5 shaft has been deepened 21ft. to a total depth of 102ft.; crosscut W. extended 105ft. and E. 30ft.; no good results. W. shaft, in the S.W. corner of lease 953, was sunk in the gully to a depth of 30ft.; from thence a crosscut was made E. 15ft., with the object of intersecting Sullivan's lode; no result so far. New shaft on the E. side of lease 952 was sunk on an outcrop to a depth of 42ft. Dawes' original shaft was deepened to 65ft., and some surface prospecting has been done on lease 959. No work has been done on the other leases belonging to the company.

The company is to be commended for the amount of work done in sinking and driving, but it seems to have erred in putting down so many shafts and connecting them by drives at a comparatively shallow level. No. 1 shaft is in the best position for prospecting for continuations of Fabian's, McKechnie's, and Ward's reefs, worked on the adjoining Blocks mine. The sinking of this shaft (or No. 2, which is some 50ft. deeper than No. 1) to a depth of 200ft., and crosscutting therefrom, is the principal work required. (Government Geologist, 25-2-02.)

Later, No. 2 shaft was deepened to 200ft. from the surface and crosscuts made E. and W. No payable stone was found.

Tarcoola South.—This company holds four gold mining leases, Nos. 1012 and 1120, on the S. slope of the W. end of the Tarcoola Range, and Nos. 998 and 999 adjoining and S. of the Tarcoola Blocks property. On lease 1012 two shafts have been sunk, the W. shaft to a depth of 50ft. on a small quartz vein, in which free gold is occasionally seen, and assays gave 15dwts. per ton; this strikes nearly N. and S. The E. shaft was sunk 50ft. on a quartz reef 18in. to 2ft. wide. It strikes N. and S. and dips to the E.; from the bottom a drive was made 40ft. S., where it appeared to pinch out in hard country; drove N. 15ft., when the reef was much split up. This reef showed gold by dolly and assayed 7dwts. Lease 998—The W. shaft was sunk 33ft., and a fair supply of salt water struck, which was used for condensing by the Tarcoola Water Supply Company. E. shaft, close to the N. boundary of the block and near the strike of Dedman's reef, was sunk to 145ft.; good sinking to 100ft., when hard quartzite was struck; the shaft makes over 2,000galls. of salt water per diem. At 51ft. crosscuts were put in 20ft. E. and 51ft. W., with no result. A crosscut W. was started at 133ft., worked for 10ft. in hard quartzite, and discontinued on account of water. A small vein of ferruginous quartz coming in from the W. was struck at 100ft.; it continued to 130ft., when it was lost in a soft depth. This vein showed gold by dolly, and assayed 9dwts. Only surface prospecting has been done on lease 999. (Government Geologist, 25-2-02.)

These leases have been acquired by the Blocks Co., and no further work has been done upon them except a prospecting shaft 30ft. deep sunk on lease 1012. (8-12-02.)

Tarcoola United.—In this property there are five shafts sunk, ranging from 24ft. to 63ft. in depth, and several trial pits that will average from 10ft. to 12ft. deep; also several chains of crosscutting. In Gee's shaft, which is in block 1079 and adjoins the Enterprise, a formation about 10ft. wide has been cut, very much broken, but containing fine colors of gold. This is probably a continuation of the Enterprise lode, at this particular point not so well defined, but probably may improve by driving S. Country rock is chiefly granite. (I.M.R., 29-7-01.)

This company holds 14 20-acre blocks in various portions of the field, viz., 1080, 1081, 1082, 1084, 1073, 1076, 1078, 1079, 1072, 1083, 1077, 1085, 1074, and 1075. These were originally taken out by the prospectors employed by the Pioneer and Excelsior Syndicates, of Port Augusta, in May and June, 1900. On leases 1080 and 1081 costeans were sunk, but nothing found. On lease 1073 a vertical shaft

62ft. deep was sunk in hopes of striking the reef found on Associated lease 1031, but with no result. Lease 1076—Three pits, average 11ft. each, sunk on quartz leaders, in which a little gold was found near the surface. Lease 1084—A similar amount of work was done, with the same result. Lease 1082—A shaft 60ft. deep underlie to the S was sunk, thence drives 23ft. E. and 29ft. W. ; also from the bottom of the shaft a N. and S. lode was driven on N. for 30ft. These workings were in a large irregular body of quartz, the stone from the upper portion of which showed occasional nice specimens of free gold, and assayed from 5dwts. to 1½ozs. of gold per ton ; at the lower portion the E. and W. stone appeared to cut out, and in the N. drive the lode continues 4ft. wide, and is worth a few pennyweights per ton. This place should be further prospected. Lease 1084—Shaft 14ft. ; no result. Lease 1079—Situated N. and adjoining the Enterprise mine. A shaft, with the object of striking the Enterprise lode, was sunk to a depth of 62ft. ; thence a cross-cut W. for 63ft. At 43ft. along this the footwall of the Enterprise lode was met with, and it was found to be a much-disturbed lode body 15ft. wide. Drives were made 18ft. N. and 21ft. S. along the lode, which so far only shows traces of gold ; this requires further development. Lease 1083—Shaft sunk 23ft. on small quartz veins, with no result ; and second pit of 7ft. on a parallel vein. Lease 1075—Pit 19ft. deep on a quartz vein 15in. wide, which carried a little gold on the surface. No work had been done on leases 1072, 1074, 1077, 1078, and 1085—operations were suspended in July, 1901—and the sinking of the shaft on 1079 was resumed for a short time in September, when it was continued to 140ft. There is a fair supply of stock water in this shaft. (Government Geologist, 25-2-02.)

Section 795—formerly lease 1074—taken up by M. S. Conlin, who raised 5 tons of quartz, which, on treatment at the Government battery was found not to be payable.

Taroola Victory.—This mine is situated towards the E. end of the field. Five shafts have been sunk, ranging from 20ft. to 103ft. in depth, and a considerable amount of cross-trenching on the various formations running through the property has been done. (I.M.R., 29-7-01.)

Consists of five 20-acre leases, Nos. 1086, 1087, 1090, 1091, and 1093, situated S. of the Mauser Rock in an adjoining low range of hills. Worked, with intervals, until July, 1901. Gold was found on the surface on lease 1091 in August, 1900 ; a shaft was sunk near the spot and fresh water struck at 90ft. ; the shaft was continued to 103ft., from whence a drive 20ft. S. and a crosscut 28ft. W. was made. The supply of fairly good water amounts to about 250galls. per diem, but the shaft gave no results so far as the gold was concerned. The rocks here are slate, diorite, and quartzite. Various costeans and prospecting pits were sunk on the leases, but nothing of importance found. On lease 1087 a shaft was sunk 26ft. in search of a lode found in the adjoining—Curdnatta 1133—lease. At this depth a crosscut was made S., which at 78ft. struck the footwall of a lode, and at 91ft. the hanging-wall was reached ; it was found to be a large lode body of quartz and ironstone carrying a little gold. Strike E. and W., with a dip to the S., the country rock being slate. Another shaft was started 150ft. to the S., in order to strike the lode at about 80ft. from the surface, but at 54ft. a strong influx of indifferent stock water was met with, and at 50ft. a crosscut N. towards the lode was started ; this had advanced 9ft. when work was discontinued owing to lack of funds. (Government Geologist, 25-2-02.)

Tolmer's Hill (5 miles W. from Taroola).—Fine gold occurs here in a lode formation striking W. 10° N., and dipping at an angle of 45° S. It consists of a highly metamorphic slate and grit and decomposed dioritic rock. The gold, which is very fine, occurs in quartz and ironstone, as well as in the previously mentioned lode formation. A diorite dyke occurs in conjunction with the quartzite forming the country rock in this locality. The formation is peculiar and unusual, and should be prospected at depth, as it may alter in character and will probably be found to contain more gold. (Government Geologist, 11-1-01.)

The workings extend for a considerable distance on a low line of ridges, which in places show lode croppings that have been slightly prospected, principally by trial pits and open trenches; the deepest, so far as I could see, being Tolmer's shaft, which had been sunk on the vein underlie to the depth of about 40ft., there being about 12in. wide of lode matter, composed of quartz, iron, and slate material of a favorable character for containing gold. (I.M.R., 29-7-01.)

Warning (gold lease 997).—Rich specimens of gold were obtained in a lode, consisting of quartzite, intersected by veins of quartz with kaolin. The apparent thickness of the lode at 10ft. down was 5ft. between walls, which latter were fairly well defined. The gold was scattered freely through the quartz, quartzite, and kaolin in unusually coarse pieces. At a subsequent visit I found the shaft down 28ft. The walls still continued to dip W., and the lode, although not showing gold, maintained its character. More attention than hitherto should be devoted to the sinking of the shaft, in order to test the lode where it passes through the quartzite and enters softer country, and to prospect it for other shoots of gold which probably exist. The principal work has been the driving of a tunnel through hard ground for 129ft. to strike the lode about 190ft. from the entrance at 46ft. below the surface and at the same point as that proved by the shaft. (Government Geologist, 11-1-01.)

The work of development in this holding is at present confined to two shafts, 45ft. and 84ft. respectively. The stone in the former was very rich near the surface, and continued so for about 20ft. in depth, at which point the shaft entered into dense hard quartzite, the lode going N. disappearing. At the 20ft. level a drive is being driven S. on a vein of ore from 12in. to 18 in. wide, at times showing gold freely; but apparently the richer portion has been passed through and will be discovered dipping S. at the same angle as the strong quartzite bar, which has caused the lode's displacement; and probably will be found from the second shaft, which is at present 84ft. from the surface, and has a crosscut driven 33ft. The appearance of the lode formation is at present of a rather complex character, and will require further explorations from the deeper shaft previous to its size, trend, or value being determined. In the ore dumps there are from 90 tons to 100 tons of stone, 20 tons of which should give good returns, and the balance, although of lesser value, should prove payable. Other explorations are being carried out, but it would be advisable to allow these to remain until the deep shaft mentioned is further explored. (I.M.R., 29-7-01.)

Operations were started in June, 1900. Rich specimens of gold were obtained in a lode, striking 342° , consisting of quartzite intersected by veins of quartz with kaolin. The apparent thickness of the lode at 10ft. down was 5ft. between the walls, which were fairly well defined. The gold was scattered freely through the quartz, quartzite, and kaolin in unusually coarse pieces, and extended to 18ft., below which the definition of the lode body was lost, and was only represented by a small vein of quartz. After a considerable amount of prospecting by winze and drives from the new shaft, and off the line of lode, a crosscut driven E., on intersecting the vein seen in the bottom of Williams' shaft, struck a pocket of rich stone at a point 50ft. S. of and below that shaft. A winze was sunk in this vein, which has the same strike as the lode in Williams' shaft, viz., 342° , in hard quartzite to a depth of 70ft., being 11ft. from surface; and a drive N. along the vein is in progress, with the object of tracing the vein into softer ground and striking the shoot of gold lost in Williams' shaft. A shaft has also been started on a promising-looking N. and S. quartz reef about 18in. wide, and situated in the centre of the lease. Two parcels, totalling 68 tons 17cwts., taken from the dump and consisting of veinstone and quartzite rock, have been treated at the Government battery and gave a return of 34ozs. 15dwts. 1gr. of gold, value £3 8s. 10d. per ounce. (Government Geologist, 25-2-02.)

The winze on the small vein of quartz was sunk to 80ft. below the tunnel level and then discontinued owing to the hardness of the country. A shaft was sunk

to a depth of about 50ft. on a small quartz vein, near the centre of the lease, which carries a little gold. Operations were discontinued in August, 1902, and in November the lease was purchased by the Blocks Co.

Total stone treated, 88 tons 17cwts. for 41ozs. 3dwts. 9grs. gold bullion, valued at £138 6s. 11d.; stone worth 31s. per ton.

Warrigal East.—The Warrigal East has been prospected by sinking five shafts, ranging from 47ft. to 57ft. in depth, also a large amount of crosscutting done and trial pits sunk; but the result up to the present has not been of importance beyond proving the strike of different veins, which may improve in value as they are explored. (I.M.R., 29-7-01.)

Leases 1024 and 1025.—They adjoin the Warrigal on the E. and the United lease 1082 on the N.; the blocks extend for $\frac{1}{2}$ a mile along the S. slope of the Tarcoola Range. Work has been confined to the W. block, 1024, only surface prospecting being done on the E. one, 1025. Shaft No. 1, situated on top of the hill in the N.W. corner of 1024, is in sandstone, slate, and quartzite country, and was sunk on a quartz vein to a depth of 40ft. Near the surface free gold was seen in the stone, and very good results were obtained by dolly. The vein is small and was driven on from the bottom of the shaft 30ft. S., when it cut out. A crosscut was also made for 42ft. W., but nothing was struck. No. 2 shaft, in the S. portion of 1024, near the Warrigal boundary, was sunk vertically to a depth of 54ft. on the outcrop of a quartz reef striking N. and S. and dipping to the W.; the reef left the shaft at 19ft. from the surface and was struck by a crosscut W. 19ft. from the bottom of the shaft, when it was found to be 2ft. 6in. wide and contained a little gold. It was driven on for 17ft. N., when it pinched to 6in. in hard quartzite. No. 3 shaft is near the centre of the block and near the United boundary; it has been sunk on the outcrop of a large and well-defined reef, which strikes nearly N. and S. and dips to the W. At 20ft. the reef dipped out of the shaft, and at 54ft. a crosscut W. struck the reef at 19ft.; thence a drive was made along the course of the reef N. for 72ft.; here a chamber was cut and a winze sunk 58ft. on the underlie of the lode, and from the bottom of this a drive was started S. along the lode. Water to the extent of 300galls. per 24 hours was struck and could not be satisfactorily coped with in these workings. The reef averaged 2ft. in width, is heavily charged with pyrites, and carries a little gold throughout. No. 4 shaft is on the side of the hill. It was sunk on a quartz outcrop 28ft. vertically; thence 41ft. on the E. underlie, when the reef pinched to 6in. and was barren. Shaft No. 5 is a prospecting pit on the Warrigal boundary. Shaft No. 6, situated between shafts Nos. 2 and 3, was sunk on a reef 15ft. vertically, and thence 44ft. on a W. underlie. At the bottom the lode was much disturbed and split up, the country being very hard. This reef showed free gold occasionally. In October, 1901, the company ceased work and went into liquidation. (Government Geologist, 25-2-02.)

Twenty-two tons 10cwts. treated for 11ozs. 18dwts. 4grs. gold bullion, valued at £34 1s. 10d.; stone worth 33s. per ton.

Wilgena Associated.—The principal working in this property is the sinking of a shaft to the depth of 90ft., 62ft. being vertical, the remainder being on the underlie. At the 60ft. level two drives have been driven on the lode, each about 12ft. in length, disclosing a vein of ore from 12in. to 18in. wide. The formation on each side is of very broken material and said to contain gold, which doubtless is correct, it having every appearance of lode formation. Samples taken from the vein yielded 8dwts. and 1oz. 6dwts. of gold per ton, and samples taken from the ore dump 3ozs. 14dwts. per ton. In other parts of the property there has also been a large amount of work done in sinking prospecting shafts and crosscutting. (I.M.R., 29-7-01.)

This company held six gold mining leases—Nos. 957, 958, and 1235, at the W. end of the Tarcoola Range; 1030 and 1031, adjoining and to the N. of Proprietary Blocks 935 and 951; and 939, at the Glory Quayle Rock.

Work was started in June, 1900. Surface gold was found in a quartz reef on lease 957, and a shaft 49ft. deep was sunk. At this depth the reef was 2ft. wide and carried a little gold. On lease 958 a shaft was sunk 36ft. on a quartz reef 18in. wide, which dipped out of the shaft to the E. at 30ft. This reef carried fair gold throughout. Three other trial holes from 6ft. to 16ft. deep, all showing gold, were sunk on this block. At lease 939 a shaft 60ft. deep was sunk on the N. boundary, and a crosscut put in 18ft. to the N. This shaft was sunk to strike a quartz reef running E. and W., which outcrops in the Government reserve alongside. Operations on these three leases were discontinued owing to shortness of funds, and work was concentrated on lease 1031, where fine specimens of gold had been found in some shallow costeans near Dawes' original shaft. A main shaft was sunk through granitic formation carrying gold, and at 60ft. a large lode body showing gold freely was struck and followed on the underlie N. to 100ft. The reef appears to strike about N.E. and dips to the N. The granite footwall is well defined, and carries on it about 18in. of gold-bearing quartz. No defined hanging-wall has been traced. A parcel, 25½ tons, from this shaft was treated at the Tarcoola Government Battery, with a result of 18ozs. 3dwts. 21grs. of gold.

Only a few prospecting pits have so far been made on lease 1030. (Government Geologist, 25-2-02.)

Shaft on 1031 was continued to 75ft., and a parcel of 21 tons 5cwts. was forwarded to the battery and yielded 14ozs. 1dwt. 2grs. of gold—13dwts. 5grs. per ton; the tailings assayed 2dwts. 22grs. per ton.

MEMO. (by manager of battery).—This parcel contained some nice quartz and gossan showing gold, and would have given a good return, but the inclusion of a large proportion of siliceo argillaceous formation and granulite, which assayed respectively 2dwts. 22grs. and 1dwt. 2grs., considerably reduced the yield.

Wilgena Enterprise, Tarcoola.—Gold leases 1019, 1022, and 1201. Adjoining the W. end of the Blocks property to the S. and W.; pegged out in May, 1900, on behalf of the Wilgena Enterprise Company (Earea Dam), and worked by that company. Coarse gold was found in a quartz reef near the surface on lease 1002, S. of and adjoining the Blocks. A shaft was sunk on the reef to water-level, 80ft. Crosscut E., 65ft.; crosscut W., 22ft.; S. drive on lode, 36ft.; no results. Colors of gold found by surface prospecting on leases 1019 and 1201. (Government Geologist, 25-2-02.)

COPPER LOCALITY, TARCOOLA.—Copper ore has been found in soft argillaceous strata, quartz, and ironstone on gold lease No. 1203. Shafts have been sunk to a depth of 25ft., and drives put in, which, according to the prospector (Mr. Dawes), cut a wide copper-bearing formation. The material raised from the shaft contains "prills" of copper ore, comprising atacamite (copper chloride) and green carbonate.

An influx of water at about 10ft. has prevented further exploration. Gold is visible in the ironstone occasionally, and a specimen of manganic iron obtained contains cobalt. The indications are favorable enough to warrant thorough prospecting.

Attention should be paid to the manganic iron on account of the presence of cobalt in the sample examined. (Government Geologist, 11-7-00.) Nothing further has been done at this place.

An official report in June, 1904, states:—

Lease 1022.—Formerly held by the Wilgena Enterprise Company. This ground is situated S. of and adjoining the Tarcoola Blocks Company's two W. leases. Close to the Blocks boundary a shaft was sunk by the original holder to a depth of about 80ft.; a little rough gold was found near the surface, but operations at depth were unsuccessful. Recently the block has been taken over by the present holders, and at 20ft. down a body of quartz passed through by the shaft has been opened up and followed to the S., where it presents every appearance of a well-defined reef, irregular in width so far, but averaging about 2ft.; it is composed of clean, slightly ferruginous quartz, showing occasional coarse gold. The strike is about

parallel to the Blocks reef, and the country rock is slate on the W. and quartzite on the E. This find promises to be of importance, and should be vigorously prospected. Twelve tons treated at the Tarcoola Government Battery gave 8½ozs. of gold.

Associated Lease No. 1031.—The gold-carrying bodies prospected by the shaft here have proved, so far, to be irregular and buncny, but the occasional richness is demonstrated by the facts that in the latter part of last year a party of men working on tribute (W. C. Dawes and party) took out 23 tons 15cwts. of stone, which yielded 84ozs. 9dwts. 8grs. of gold, valued at £321 17s. 2d.; this was found E. from the 60ft. level, and the company afterwards raised 20 tons 8cwts., which gave 22ozs. 8dwts. 8grs., valued at £83 18s. 10d. The lease is now held by the Tarcoola Blocks Company, and a crosscut is in progress E. from the bottom of the shaft, 100ft., in order to intersect the probable shoot of gold-bearing stone in that direction.

Total stone treated, 91 tons 3cwts. for 139ozs. 2dwts. 15grs. gold bullion, valued at £508 2s.; stone worth 111½s. per ton.

Warrigal.—This lease is now held by the Tarcoola Blocks Company. From the old shaft, near the surface, the auriferous vein has been followed to the S. for about 40ft., and also for some distance to the N.; it carries gold, but is too small to be profitably worked, and in the lower levels the vein was also followed with a similar result. On the S. boundary prospecting pits are being put down on some small quartz veins, which show a little gold and appear to be increasing in size in depth. A prospecting shaft will probably be sunk between this place and the old shaft.

Tarcoola Gem.—Old Proprietary lease No. 935, now held by a small local syndicate. From a small quartz vein on top of the hill a parcel of 7 tons of stone was treated, with a total result of 7ozs. 1dwt. 19grs., but at a depth of 23ft. the vein cut out. Two men are now prospecting surface leaders of quartz, which occur in a decomposed kaolinised dyke formation which traverses the top of the hill. Nice specimens have been found, but no definite reef has yet been struck. The place is well worth careful prospecting.

Nineteen tons 14cwts. treated for 55ozs. 13dwts. 12grs. gold bullion, valued at £171 16s. 4d.; stone worth 172s. per ton.

Warrigal East.—Some work has been done at the shaft in the N.W. corner of lease 1024. At 16ft. down this shaft is in soft kaolinised material; a vein of quartz dipping S. was passed through. This has been followed down for about 20ft. to the drive made by the old company from the bottom of the shaft; it is irregular in size, varying from 2ft. to a few inches. Nineteen tons from this vein have been treated at the Tarcoola Government Battery, and gave 9dwts. 22grs. per ton.

Section 787.—Formerly United Company's lease 1079.—Two men are working here, and have sunk two prospecting pits about 12ft. deep each, on two parallel veins of quartz and granite. The width of each is about 1ft., and they show a little fine gold. It is proposed to have a small parcel treated from each of the veins. (14-6-04.)

This was named the *Last Resource*, and on the N. vein a large open trench was made, terminating in a shaft about 40ft. deep; 132 tons taken from this were treated and yielded 101ozs. 17dwts. 6grs. of gold bullion worth £364 18s. 4d., the value of the stone being 55½s. per ton. (24-10-07.)

Hisgrove's.—Late lease 1,021 (*Enterprise*). A N. and S. vein was found on this, and from an open cut 32½ tons were taken and treated, yielding 24ozs. 8dwts. 21grs. of bullion valued at £160 15s. 5d., the stone being worth 99s. per ton. (24-10-07.)

Tarcoola West.—Lease 1171, adjoining the Royal George. A shaft has been sunk in the N.W. corner of this lease, about 130ft. S. from the Royal George shaft. The sinking was through granulite to a depth of 100ft., and from the bottom a drive is in progress N. through decomposed granite and slate towards the drive from the Royal George shaft, in order to prospect gold-bearing stone supposed to exist

there. Crosscuts E. and W. should be also made from the bottom of this shaft to intersect gold-bearing veins which may be reasonably expected to exist in the vicinity.

Proprietary Lease No. 951.—Here on the hilltop a prospecting shaft and workings are in progress on a quartz vein about 6in. in width, and striking N. and S. across the hill. Six tons raised from this place have been recently treated for 10dwts. per ton. This is encouraging, and there are several other veins in the vicinity which could be easily tested by crosscuts from the shaft when a fair depth has been attained. *Lease 935.*—In a steep gully, at a point about 150ft. from the S. boundary, a tunnel has been driven for 60ft. N. along a quartz vein, which runs with a formation of soft decomposed rock about 4ft. wide, between slate and quartzite walls. The quartz vein is very irregular in width, ranging from an indicator to, in places, 1ft. wide. It carries a little gold, and as this is probably a continuance of one of the Blocks lodes, works in the tunnel should be further prosecuted.

Tarcoola Enterprise.—No work is in progress here, but recently a syndicate took, from near the 130ft. level at the deep shaft on lease 1020, 8 tons of stone which yielded 1oz. 15dwts. per ton, and from the dumps at this shaft picked 16 tons which gave 1oz. 12grs. per ton. The same syndicate raised from a surface reef, on lease 1021, 5 tons of stone which returned 13dwts. per ton.

Old Lease 938.—A quartz reef has been found here, and traced by surface openings, the deepest being about 10ft., for a length of about 8 chains; it strikes N. and S., averages 1ft. in width, with a nearly vertical dip; country rock, granite. The reef is a well-defined one, and a trial crushing of 5 tons gave 2ozs. 3dwts. 18grs. of gold.

Curdnatta.—The only work done at this mine for some time past has been the removal of ore by tributers—9 tons 5cwts. being recently treated for 9ozs. 1dwt. 4grs. of gold. When sinking was discontinued by the company, the reef in the bottom of the deepest shaft, 100ft., was of fair size and carried gold. (D.R. (Gee), 14-6-04.)

EAREA DAM.

Kingsmill's Discovery.—At the locality near Earea Dam, where rich gold in quartz was found by Mr. Kingsmill, the rock formation is limestone and calcareous sandstone in horizontal beds of Tertiary or Secondary age. This formation is apparently of similar age to the cappings found associated with conglomerate near Glenloth, near which gold was found some years ago. It often contains erratic pebbles and other detritus of various older rocks, even at long distances from the latter. In this locality it rests on granitic rocks known to be gold-bearing, and it is quite likely that the specimen found was deposited in a similar manner, and afterwards exposed by the erosion of the limestone rock. (Government Geologist, 11-7-00.)

Wilgena Enterprise.—This mine has been opened up on an outcrop of magnetic iron ore and quartz in granite country, traversed by felsite and dioritic dykes. The work done has proved that the lode, which was 4ft. wide at the surface, pinches at the water-level (105ft.) to widths of from 2ft. to 3in. It strikes N. and S., and inclines from the surface to 40ft. S. at an angle of 45°, afterwards from 28° to 30° in the same direction. The walls are fairly well defined, and as long as they continue so the lode may be driven or sunk on with a reasonable expectation of meeting with new makes of stone. The shoot of auriferous stone hitherto worked has been deposited near the junction of two igneous dykes, at a point where they intersect the granite. The gold occurs in the magnetic iron ore and quartz, and is also sometimes visible in the granite formation between the walls. About 170 tons of ore have been raised for treatment, chiefly from the lode above the 40ft. level; of this 2 tons have been treated, which returned 4ozs. 3dwts. 13grs. of gold per ton. (Warden's Report of February 28th, 1900). The lode, although irregular in thickness, is worth more energetic prospecting both by sinking and driving, with the object of discovering other bodies of auriferous ore. An attempt should be made to trace

the lode along its strike to locate any additional bodies of ore which may approach the surface. This information would be of use in indicating the direction and distance at which the levels along the lode, at depth, should be driven. As to the question of machinery for treating the ore: although at the present time there is not sufficient ore to keep even a small battery continually at work, yet, if further development proves satisfactory, the erection of machinery should be proceeded with. This would also encourage prospecting in the district, by enabling miners to ascertain the value of any ore they may discover. Assays of samples taken by me showed the presence of gold in the lode at the lower level (105ft.), where it is much pinched, the returns ranging from a trace to 8dwts. per ton. Average samples from the 40ft. level returned 1oz. 18dwts. and 1oz. 7dwts. respectively per ton: (Government Geologist, 11-7-00.)

No apparent work has been done since my report in last July; consequently I am unable to give any additional information regarding it. The metalliferous rock formations here are exposed in patches of only limited extent owing to the prevailing covering of Tertiary and recent deposits. They include white, pink, and red granulate and granite, hornblendic granite, graphitic granite, felsite, felspar, porphyry, diorite, and metamorphic, hornblendic, and felsitic rocks, often much decomposed and kaolinised. Although there is not a large field for prospecting, yet the discoveries already made of gold and tin should induce those persons who hold the ground under lease to prospect more energetically than they have hitherto done. (Government Geologist, 11-1-01.)

Situated in the vicinity of Earea Dam, about 35 miles S.E. of Tarcoola. The principal development work has been sinking shafts and cross trenching. The veins not appearing on the surface, it is necessary to adopt the latter course previous to incurring the expense of sinking. At the time of my visit the main shaft had reached the depth of 170ft. at an angle of 45° , the vein formation ranging from a few inches to, in places, 4ft. in width, containing veins of quartz and ironstone—very irregular and broken; but, when sorted from the debris, or the low-value portions of the formation, containing, in places, material of very fair value. Drives have been driven N. and S. at the 40ft. level, each about 30ft. At these points the vein has pinched very small and is of low value, but, judging from the character of the formation, should the drives be continued, the vein would probably make again. At the shaft bottom the formation is of similar appearance to that in the upper workings, there being about 18in. in width of gold-bearing material, with a small seam of quartz 2in. thick. A bulk sample taken from this material as placed in the ore dump, which is chiefly ferruginous clay, yielded 6dwts. per ton, and a picked sample taken from the small vein returned 2ozs. 6dwts. of gold per ton; also samples taken from the ore dumps from the 40ft. level yielded, for the better class material, 10dwts. per ton, and for the second class 3dwts. per ton. From the general appearance of the formation it is evident that drives should be continued on the course of the formation a much longer distance to prove if the gold-bearing material is confined to a short shoot or otherwise. In this locality there have been several other mines, and a considerable amount of work has been accomplished in sinking shafts and crosscutting; but, all the works now being suspended, and the formations not cropping above the surface, but little or no idea can be formed as to their value. (I.M.R., 29-7-01.)

This auriferous lode was discovered in 1899, and has been worked intermittently throughout by the original Port Augusta shareholders. The lode strikes 356° and dips to the E. The shaft has been sunk to a depth of 198ft. on the inclination of the lode, which is 45° near the surface, and afterwards varies from 28° to 30° . The walls are fairly well defined; the lode consists of magnetic iron ore, quartz, and gossan, and is 4ft. wide near the surface, and at water-level (105ft.) varies from 2ft. to a few inches. The country rock is granite and hornblendic granite, traversed by felsite and diorite dykes. The gold occurs in the lode material, and is also sometimes found in the granitic formation between the walls. Two tons taken from

lode near the surface and treated at Petersburg in February, 1900, yielded 4ozs. 3dwts. 13grs. per ton. A second parcel of 3 tons from above 40ft., treated in April, 1900, yielded 2ozs. 3dwts. 18grs. per ton. At 180ft. the lode is 3ft. wide, 2ft. of which is quartz, and carries gold all through. At 40ft., on the incline, levels have been driven N. and S., from which stone for treatment is being raised. Eighty feet E. from the underlie shaft a vertical shaft has been sunk, which intersects the former at 100ft. along the lode and facilitates haulage from the bottom; but at present operations are confined to the 40ft. level. In January, 1902, 33 tons of stone were treated at the Tarcoola Government Battery, and yielded 39ozs. 16dwts. 28grs. of gold (1oz. 2dwts. 16grs. per ton), value £160 6s. 9d. It is to be noted that this gold is of very high quality. The results obtained by the crushings show that the mine is of considerable value, and should be operated on more extensively. The opening up of this lode by drives at the lowest depth reached is most desirable in order to facilitate the workings of the auriferous stone already proved, and to intersect other makes of stone which are indicated by outcrops along the line. Other gold-bearing veins have been found off the main line, which can be tested by crosscuts from the deep workings of the main lode, when such have been proceeded with. (Government Geologist, 25-2-02.)

No developmental work done during 1902. Operations limited and confined to stopping at the 40ft. level. A parcel of 54 tons was treated at the Government Battery in July, and yielded 55ozs. 6dwts. 13grs. of gold, valued at £224 15s. 5d.

No systematic or developmental work has been done on this mine for some time past. Recently tributaries have been working at the 40ft. and 60ft. levels. One parcel of 25 tons 5cwts., yielding 1oz. 4dwts. 6grs. per ton, and another of 72 tons, 15dwts. 17grs. per ton. This mine was discovered in 1899. The lode has been followed down for over 200ft., and has been proved to be auriferous to the bottom, and of a fair average width. The total amount of stone treated up to date is 359 tons, for a return of 326ozs. of high-grade gold, and it is greatly to be deplored that through lack of capital this promising property is not properly worked and developed. (D.R. (Gee), June, 1904.)

Henderson.—These claims adjoin the Sutherland to the S. Costeans have been cut, and two shafts about 10ft. and 12ft. sunk. The claims are well situated in connection with the other properties, but so far nothing of value has been discovered. (28-2-00.)

N.W. Prospecting Association.—This block adjoins the Enterprise to the N. A large number of costeans and trial pits have been put down without discovering anything of value. At a site about 60ft. E. of the probable course of the Enterprise lode a shaft was sunk to 96ft. without striking the lode. (28-2-00.)

Pioneer.—This syndicate held two leases adjoining the Enterprise—one to the W. and the other on the E. On the W. one costeans have been made in many places, and near the S.W. corner, adjoining the Warburton, a shaft has been sunk on a small irregular vein carrying gold. On the E. lease there are numerous costeans, an open cut, and two shafts. The open cut, 25ft. long and 14ft. deep, was made to work an irregular lode, consisting of quartz and ironstone, about 2ft. wide, with a strike of 96° and an average dip of 48° E.; 2 tons 16cwts. taken from this place and treated at the Government Battery, Petersburg, yielded 17dwts. 8grs. per ton. About 35ft. to the E. a vertical shaft was in progress to cut this lode. To the S. another shaft was sunk. At 10ft. a small quartz vein carrying gold was struck, and lower another larger one, which seems to strike N. by E. and dip E. It opens out strongly at the bottom of the shaft, and may possibly turn out to be a continuation of the lode in the open cut. Samples taken from the bottom (25ft.) assayed 1oz. 14dwts. of gold per ton and 10dwts. of silver. (28-2-00.)

Port Lincoln Syndicate.—This lease is in a granite rise about $\frac{1}{2}$ mile S.W. from the Enterprise. Costeaning has been done, and in a shaft 15ft. deep a promising-looking ironstone leader dipping to the N. was struck, along which driving was commenced. Sample taken, in which no gold could be seen, assayed 2ozs. 6dwts. per ton. (28-2-00.)

Sutherland's.—These claims adjoin the Pioneer W. lease and the Warburton to the S. Prospecting by costeans has been carried out, and there are two shafts 15ft. deep, 20ft. apart, connected by a drive. The W. shaft and the drive disclose a small irregular lode body, consisting mainly of ironstone and quartz, which shows free gold and is worthy of further testing. (28-2-00.)

Gourlay's Lease.—Originally prospected by the late J. W. Sutherland. Small shallow shafts, the deepest being 30ft., have disclosed a lode formation, which is now being followed to the E. from the bottom of the 30ft. shaft. Irregular bodies of ironstone and quartz carrying gold have been met with in the workings; one parcel of 10 tons gave total 12ozs. 14dwts. 21grs. of gold, and another of 8 tons, 3ozs. 12dwts. 16grs., and the place is well worth further prospecting. (D.R. (Gee), June, 1904.) Total treated 37 tons, yielding 23ozs. 18dwts. 19grs. bullion, valued at £93 1s., the stone being worth 50½s. per ton. (30-6-07.)

Warburton.—These claims adjoin the Enterprise and the Pioneer on the S. Four prospecting shafts have been sunk. The deepest, 57ft., adjoins the E. boundary of the Pioneer W. lease. The object in sinking was to strike the vein found in the Pioneer. A trace of gold was found at 23ft., and water was struck at the bottom. The other shafts, 15ft., 20ft., and 15ft., disclosed nothing of value. Costeaning has also been done. The block is well situated, and should contain the continuation of the Enterprise and Pioneer lodes.

In addition to the claims mentioned there are a large number of prospecting workings in the locality, but in no case has anything worth following up been struck. This is not to be wondered at in a district where prospecting is so extremely difficult, and where the elements of luck and chance enter so largely into the wished-for success. (28-2-00.)

TIN DISCOVERY NEAR EAREA DAM.

South Lake Tin.—This is situated about 1½ miles S. of Earea Dam, on a mud lake where the surface sand and loam have been eroded, and expose granite, diorite, and other hornblendic rocks containing quartz veins. The tin oxide was originally discovered in a quartz vein and detritus denuded from it and the surrounding rocks. There is only a thin covering of alluvial soil at this point, but from it, immediately over the outcrop, I had a dishful of stuff washed which yielded 1lb. 10ozs. of tin ore, which, on being smelted, returned 1lb. of tin. The prospectors appear to have entirely devoted their attention to sinking on the quartz veins, and to have lost sight of the probable presence of alluvial or stream tin. The probability is that prospecting for alluvial tin instead of lode tin would meet with more success. Systematic prospecting in order to trace the ore towards deeper ground, where larger deposits may exist, is in my opinion the course that should be followed; as it is a well known fact that stream tin is often derived from small veins and pockets in granitic rocks which are too small to be profitably worked as lodes. Salt water is abundant in this locality at a depth of a few feet from the surface. (Government Geologist, 11-7-00.)

At the site of the original tin ore discovery I had the shaft bailed of water to a depth of 8ft., and ascertained that the tin oxide occurred in a decomposed granitic dyke, which contained payable ore for a width of 4ft., and traces of tin for a much greater width. Quartz in veins and bunches, included in the dyke, also contained tin ore. It is most probable that additional deposits of ore will be found in this dyke, and that other tin-bearing dykes exist in the neighborhood. As mentioned in my report of July last, there is also a great probability of "alluvial tin" being found. Shafts should be sunk through the sand and Tertiary deposits surrounding the lakes to prospect for deep ground and washdirt containing tin ore. (Government Geologist, 11-1-01.)

Tin oxide occurs in decomposed granitic dykes and in veins and bunches of quartz, as exposed in the prospecting shaft. Several other shafts have been sunk in proximity to the first one, and tin disclosed in similar dyke formations, the general

trend of which is N.W. and S.E. Owing to the quantity of water met with, sinking has not been carried below 54ft. ; it is now proposed to prospect the ground to a greater depth in order to test these dykes, and pumping machinery will be necessary to do this work. Tin ore in small quantities has been found in the surface deposits of the lake and in shafts in the sandhill country adjoining. There is a probability of alluvial tin being traced from this lake, but owing to the prevailing covering of sand rises and ridges considerable difficulty is placed in the way of prospecting. *This is the first authentic discovery of tin ore in South Australia proper*, and, considering the small amount of work done so far, the prospects are decidedly encouraging, and the sinking of a shaft to the depth of, say, 100ft. and crosscutting and driving at that depth, are the best means to be recommended for proving these tin-bearing bodies. (Government Geologist, 25-2-02.)

GLENLOTH.

Extract, dated January 11th, 1894, from the Annual Report of the Government Geologist for the Year ending June 30th, 1894.

No. 1 Gold locality is in the vicinity of Lake Harris, 36 miles in a S.E. direction from Wilgena Head Station and 8 miles N.E. of Arcoodaby, an outstation of Wilgena. The gold occurs in surfacing and the alluvium of a gully near where it is crossed by a quartz, quartzite, and granite reef running N. and S. From this place it has been traced down the gully for 100yds. or more, but, as the gully widens out considerably, the run of gold has not been traced further. The gold, which is not water-worn, is flaky and filamentous in character, and has apparently been derived from a vein or veins in the immediate neighborhood, which veins were probably small and consisted of gossan or soft flucau. The bedrock consists of soft kaolinised granite, with quartzite and hard granite, and contains quartz reefs; overlying these there are cappings of jasper, quartzite grit, sandstone, and quartz conglomerate of probably Tertiary age. These form low tablelands, with escarpments, and the conglomerate is likely to contain gold. The country is comparatively flat and the hills of small elevation.

The gullies are flat and ill-defined a short distance after they leave the low ranges, and there is a general absence of alluvial deposits and watercourses, which tend to make prospecting more laborious and uncertain than is usual. There are a good number of large quartz reefs in the neighborhood, traversing the kaolinised granite, and striking in a N.N.E. and N.W. direction. The quartz is white and glassy in character, and there is an absence of gossan, although it is possible that veins of this and pyrites exist alongside in connection with them, which do not show on the surface.

About $1\frac{1}{2}$ miles E. of Keynella Well there is a hill from 150ft. to 200ft. in elevation, chiefly composed of brown iron ore, hematite, jasper iron ore with flint and quartz veins, traversing kaolinised granite, indurated felstone, syenite and other granite rocks.

The great drawback to prospecting is the red loam and sand covering I have so often alluded to, the absence of well-defined gullies and watercourses, and the limited extent of the isolated patches of bedrock, from veins in which the gold is derived. There is no doubt, however, that the gold found is sufficient to show the probability of payable patches existing in the neighborhood and between this place and Lake Harris, but it is only by a large expenditure of time and labor in prospecting that such are likely to be found.

The nearest wells are Glenloth, $1\frac{1}{2}$ miles W. ; Arcoodaby, 8 miles S.W. ; and Yerda, 7 miles W. I understand that the depth of sinking does not exceed 100ft. The water is obtained from the granitic rock, which in all cases is kaolinised to a considerable depth below the surface.

An official report of October, 1902, states:—

Darley's.—This is situated about 1 mile W. of Glenloth Well, and about the same distance S. of Gold Locality No. 1 (*vide* Annual Report, 1894). In June, 1901, small disjointed veins of quartz were found a few feet from the surface by sinking in the calcareous soil and decomposed granitic rock. Gold in fine particles was freely disseminated through the stone. The strike of these veins was about N.W., and they were found to dip, when tested at 17ft., N.E. at about 45°, but at this depth the veins were poor and of small size, and nothing to encourage deeper sinking was found. These veins are near the junction of the granitic rocks and the diorite. Other prospecting has been done near Darley's claim without results, and so far no evidence of the presence of a persistent auriferous lode has been disclosed; this, however, very possibly exists in the locality, but the rock formations being, as usual, covered with surface deposits, prospecting is difficult and laborious. A parcel of ore treated at Tarcoola gave small results.

Pioneer—Gold Lease 1301.—Prospecting was started here about June, 1901, on some quartz veins very similar in character to those worked by Darley, but showing rather heavier gold by dolly.

The workings, about $\frac{3}{4}$ mile S.E. of Glenloth Well, are situated in a broad valley running N.W. and S.E. between two rough granite hills leading towards Lake Harris. For a distance of about 60 chains a little gold has been found, mainly by dolly, in surface stone consisting of iron-stained quartz. Small gold-carrying quartz veins were found by sinking shallow holes in the valley, but they were not persistent. Four prospecting shafts were sunk in these veins from 20ft. to 25ft. deep, in loose ground, and with a view of testing the place at depth another shaft, a little to the N.E., was started; this was sunk vertically for 40ft., from which depth the diorite, dipping to the W. at a sharp angle, was followed down for 47ft., where a body of nearly vertical granite was met with. The fissure between the diorite and the granite is about 4ft. wide, and consists of decomposed rock carrying small veins and seams of quartz; it was followed W. for 22ft., and then, at 10ft. from the shaft, a winze was sunk 40ft.; making the total distance from the surface 127ft. The work now in hand here is crosscutting E. from the 87ft. level.

These workings have disclosed nothing of value, and the stone treated at the Tarcoola Battery was taken from the surface veins and leaders near this place.

On leases 1299 and 1305 three shallow prospecting shafts have been put down; stone showing gold by dolly has been found in each of them, but sufficient work has not been done to give data for satisfactory description.

On lease 1304 there is a large lode formation which strikes about N. and S. and dips to the W.; a pit about 10ft. deep has been sunk on it, but it is, so far, unsettled and indefinite. Some of the stone taken by me about a year ago assayed 6dwts. per ton.

Fabian's No. 1 (M.C. 4663).—One mile S. of Glenloth Well. Here an outcrop of quartz was sunk upon; it was large, being in places from 3ft. to 4ft. in thickness, with a slight dip to the S.W., the strike of the reef being N.W. At about 10ft. down it contracted to 2ft. in width and dipped suddenly to the S.W. at an angle of about 40°; the shaft then followed the underlie for 20ft. beneath the reef. In the first 6ft. of the underlie shaft the reef on the S. side pinched to 2in. and then widened out till at the bottom it is 1ft. in width. On the N. side the reef is much wider, and averages 18in. to the bottom, where it is 14in.

Lake View (gold lease 1363).—This block adjoins Fabian's to the S.E.; the vein or reef is on the same line of strike as Fabian's, is dipping the same way, and it is probable that the workings are on one and the same lode body; the gold-bearing stone is of a similar character, but also includes seams of sugary white quartz containing gossany vughs.

The workings consist of an open cut, in which, at 10ft. from the surface, the defined portion of the reef was about 2ft. wide; it has been followed for a further distance of 8ft. (18ft. in all) on a S.W. underlie of 50°, and at the bottom the

reef is 8in. wide, with a well-defined hanging-wall and an unsettled footwall. A little to the W. a prospecting shaft has been sunk to a depth of 28ft. and a crosscut of 11ft. made towards the reef without striking anything.

Williams' (gold lease 1356).—This consisted at the surface of two gold-carrying quartz veins about 4ft. apart, with a narrow lode formation, which also carried gold, between them. The strike is 120° , with a dip to the N.E. of about 60° . An open cut has been made to a depth of 15ft., where the veins have come together, and are now about 18in. thick, the formation cutting out. A little to the N.E. a prospecting shaft has been sunk to a depth of 40ft.; this passed at 16ft. and 23ft. through small veins of quartz carrying gold, and at the bottom is in similar quartz. To the N.W. some pits and open cuts have been made in unsettled country along the line of lode; small veins of quartz have been found, and one coarse specimen of gold.

F. Olsen's (gold lease 1354).—Open cuts on a quartz vein striking N.W. and dipping N.E. In the deepest working the vein has been followed down to 15ft. from the surface, where it is about 12in. thick; it consists of rather vitreous, loose-jointed, iron-stained quartz, the joints being filled with a waxy-like greenish-colored chloritic deposit.

Fabian's No. 2 (M.C. 4822).—Here a well-defined vein of ferruginous quartz has been found; the strike is N. and S., with a slight dip to the E. A pit has been sunk to a depth of 12ft., where the reef is about 18in. thick.

McPherson's (M.C. 3372).—This is the most recent find at Glenloth, and consists of a reef of quartz and ironstone showing fine free gold occasionally; it strikes 350° , with a dip of 65° to the E.; it has been followed for 30ft. on the underlie, and is about 1ft. thick at the bottom.

Gordon's (No. 4779).—An open cut has been made 20ft. deep on a quartz vein 6in. wide; strike N.W., dip 40° S.W.; the stone carries a little gold.

Brennan's (gold lease 1353).—A pit has been sunk 10ft. on a lode of quartz, which shows fine specks of gold occasionally; it appears to strike E. and W., but not enough work has been done upon it to give a proper idea of its size and value.

The country rocks of the district are granite, granulite, and diorite, and the lodes, so far as exposed, are of a bunchy nature. (D.R. (Gee), 9-10-02.)

Further report June, 1904:—

Pioneer.—Work here is now concentrated on lease No. 1305, where a well-defined reef of ferruginous quartz has been found. The strike is 340° , with a dip of 45° W., and the average thickness 1ft. The reef has been tested with good results to 43ft., and a main underlie shaft is now in progress, the hanging-wall of the reef being made the hanging-wall of the shaft. The reef has been driven on close to the surface for about 120ft.; 23 tons of miscellaneous stone from here treated at Tarcoola recently gave 15dwts. 11grs. of gold per ton, but the body of the reef will probably give higher results. A sample taken by me from the face assayed 1oz. 3dwts. per ton. The mine is being opened up well and systematically.

Fabian's No. 1.—No work has been done since my last examination, except the raising of a few tons of stone from the reef. This find should be opened out, and prospected to the N.; $18\frac{1}{2}$ tons from here treated in June, 1902, gave 1oz. 0dwts. 11grs. per ton.

Fabian's No. 2.—The workings here are on a well-defined reef of ferruginous quartz, striking N. and S., with a slight dip to the E. The shaft is a little over 20ft. deep, and at the bottom the reef is from 1ft. to 1ft. 6in. thick, with well-defined walls in granite. Three and a half tons, consisting of the reef as taken out in sinking the shaft, were treated at the Tarcoola Government Battery in November, 1902, and yielded 1oz. 15dwts. 1gr. of gold per ton. No further work was done until recently, when by stoping operations, mainly to the N.W. of the shaft, 28 tons of stone were taken out and forwarded to Tarcoola. This parcel only gave 5dwts. 19grs. by battery, with 2dwts. 10grs. in the tailings; but I am informed that a considerable portion of the material bagged consisted of mullock, and far better returns

would, of course, have been obtained had only reef matter been sent in. This is a very promising show, and the shaft should be continued and the reef driven upon at depth.

Fabian's No. 3.—This is a new find made by H. Fabian, situated about 1 mile N.E. from Glenloth Well. A reef of ironstone and quartz has been opened up by a prospecting pit to the depth of about 12ft. It has a general strike of 335°, with a slight dip to the W., and at the bottom is 1ft. 3in. thick. The country rock is granite. A parcel of 8½ tons just treated at the Tarcoola Government Cyanide Works gave a total return of 25ozs. 2dwts. 3grs. of gold. The discovery promises to be an important one. The proprietor is now engaged in raising a further parcel of 20 tons, and development in depth will be a matter of considerable interest to the district. At this place specimens showing gold in the granite rock can also be seen.

Lake View.—No work has been done recently, but the underlie workings have been deepened a little, and the vein appears at present to have cut out. The shaft and drive disclose nothing, and the best course of prospecting here will be to follow on the formation showing in the underlie. Eight tons 17cwts. of stone from this place, treated in September, 1902, yielded gold at the rate of 1oz. 7dwts. 2grs. per ton.

Williams' (Glen Markie).—The open cut at the S. end of the workings has been extended N. along the course of the veins, and in the shaft near by the vein struck at 16ft. has been followed down on the N.E. underlie for about 14ft. The vein and formation at the bottom are about 1ft. 3in. thick, and carry gold. From this place a considerable amount of stone has been raised, and 50 tons treated at Glenloth Battery returned a little over 16dwts. gold bullion per ton, and it is estimated that the tailings are worth 6dwts. per ton. This property requires careful prospecting at depth, a course warranted by present results and indications.

F. Olsen's No. 1.—In this a quartz vein striking N.W. and dipping N.E. has been prospected to a depth of 15ft. by an open cut. The vein is about 1ft. thick at this depth. The gold contents, so far, seemed small, and no further work has been done upon it.

F. Olsen's No. 2.—This is a new find, situated about 1 mile S. from Williams' show. A white quartz reef striking 330°, with a flat dip E., has been followed down in the underlie for 34ft. It is 2ft. wide at the bottom; coarse gold shows occasionally in the stone. Assays of samples taken vary considerably, but a parcel of 10 tons from the reef is now ready for battery treatment. This is a well-defined and promising reef, and the battery returns will doubtless prove it to be payable.

McPherson's.—The original shaft here was sunk to a depth of 30ft. on the E. underlie of a vein of quartz and ironstone about 1ft. thick at the bottom. A sample of 1½ tons of stone from this shaft, treated at Tarcoola 18 months ago, returned gold at the rate of 1oz. 0dwts. 12grs. per ton. Nothing further has been done at the shaft, and a small prospecting pit, which discloses nothing of importance, represents all operations since my previous visit. The shaft should be continued along the vein, which is well worth opening up and thoroughly prospecting.

No work is in progress at Darley's, Brennan's, Heise's, and Brophy's claims, which are well worthy of systematic prospecting; 3 tons from the latter claim treated in July, 1903, returned 2ozs. gold per ton.

Generally, with the exception of the Pioneer Mine, very little work has been done in the district for the last 18 months; no proper working shafts have been sunk; the prospecting operations are mainly confined to shallow pits and open cuts sunk on veins and leaders of stone, more or less gold-bearing; and in no instance has sufficient work been done to determine whether these bodies are persistent in depth and continuous along their lines of strike. The results of the stone treated so far are good, and there is every encouragement for legitimate and careful prospecting. Two new and promising finds have been made recently, viz., Fabian's No. 3 and Olsen's No. 2, and there is a large extent of unprospected country in the district.

Glenloth Battery.—A five-stamp battery has been recently erected on the shore of Lake Harris, about 2 miles E. from the Pioneer Mine; it is worked by a 14 horse-power engine, with a vertical boiler. Water for ordinary battery purposes is obtained from a shallow well on the edge of the lake, but at present boiler water has to be carted from Glenloth Well, in addition to the quantity condensed. (D.R. (Gee), 14-6-04.)

Returns from this battery to June 30th, 1905, show 577 tons crushed for 372ozs. of bullion, valued at £1,323. Later the battery was taken over by the Government, and a cyanide plant added.

The first six parcels, to November 13th, 1907, totalled 147 tons, yielding 60ozs. of bullion, valued at £186 (battery treatment only).

TEETULPA GOLDFIELD.

Situated about 15 miles E. from Waukaringa, and about 25 miles N.W. of Mannahill; discovered by Thos. Brady, of Lancelot, and Thos. Smith, of Broughton, October 6th, 1886. The first gold was found in the centre of the gully now known as "Brady's." Several pieces, weighing in all about 1½ozs., were dug out of the cracks in the slate by Smith, using his knife only. The prospectors put in their claim to the Government reward of £1,000, which, on the expiry of the time laid down by the conditions and the requisite number of men being then at work, was duly paid. A rush from Adelaide and great excitement followed, and a working population numbering at one time about 4,000 to 5,000 people occupied the field. The prospectors took out their reward claims (10 in number) at the spot where they had found the first gold; other claims were quickly pegged out, following the creek in a N. direction for a distance of ½ mile. The first nugget of any size was found by McDougall and Opperman, and weighed 8ozs. 14dwts. The largest nugget known to be found on the field was got by Horner, in a claim about 20yds. N. of Brady's claim. It weighed 29ozs. 15dwts. Other nuggets, of 14ozs. 16dwts., 13ozs., 10ozs., and smaller sizes were found more frequently. Work on the field was hindered by the want of water. At first all the dirt had to be carted to Tonkin's Well, a distance of about 2 miles; later the water was pumped up to tanks at the S. end of Brady's Gully. The results from washing were variable, ranging from 1dwt. or 2dwts. up to 4ozs. per load of dirt. For a time the digging was confined to the bed of the creek, where heavy floods had washed away the earth to a depth of 4ft. Here the claims were easily worked. As a rule the earth and gravel were broken up by the pick and then fossicked over with a knife. Every gutter and crevice in the slate beds was carefully cleaned, and it was in these that the nuggets were most frequently found. About October 27th, however, some holes were put down in the high ground on the W. side of the watercourse. Here the sinking was from 18ft. to 25ft. deep. A good wash was met with about 18in. from the bottom, and in many claims the yield was very rich indeed. This locality was named Windlass Hill. From one claim the owner states he got £700 worth of gold during a period of five or six weeks, and afterwards sold his claim for £50. On the 31st October a rush took place to the upper part of the gully, S. of the prospectors' claims. This was caused by a man finding a 15dwt. nugget, together with 5dwts. of small gold. This part of the gully had been tried previously, but nothing had been found in it. This new discovery, however, put more heart into the miners, and the gully was soon tested in every part. It proved to be very rich. Nuggets weighing from 14ozs. downwards were found in many claims, and some of the washings were very good. Here the sinking averaged about 8ft. The gully was not more than four claims broad; the gold lay in gutters and pockets, and from one of these as much as 19ozs. was taken.

Goslin's Gully lies E. of Brady's Gully, runs N. and S., and joins Brady's about ½ mile below the prospectors' claims. At this place Hugh O'Kane struck a pocket containing about 24ozs. of rough nuggety gold, the largest piece being about 4ozs.

This was at a depth of 5ft. The gully was at once pegged out, and soon proved to be as rich, if not richer, than Brady's. Nuggets of good size, from $11\frac{1}{2}$ ozs. downwards, were obtained, and the washings were extremely good, many of them going 7ozs., 4ozs., 3ozs., and 1oz. to the load of dirt. This may have been due partly to the fact that the men in Goslin's Gully did not dry fossick to the same extent as did those in Brady's Gully.

Strawbridge's Gully lies S. of Brady's, and runs in a N.E. direction, emptying near Tonkin's Well. It was a most likely-looking place for gold, and was worked for some time. One man obtained a pocket holding over 6ozs., including a nugget of 5ozs. 5dwts. ; but, with that exception, so far as known, nothing more than fair prospects were obtained.

Brennan's Gully lies S. of Strawbridge's, and parallel to it. The prospectors found a sample of fine gold, others found a few grains only.

Dam Gully comes into Brady's from the W., S. of Windlass Hill. Six-ounce and smaller nuggets were found in claims on the high ground N. of the watercourse. The sinking averaged 20ft. in depth, and the gold, as in the other gullies, was very patchy and irregular.

Flack's Gully joined Brennan's Gully, and good prospects were got, but nothing very payable.

Wakefield Gully ran into Brennan's also, but above the prospectors' claims. Not very much work was done.

Langford and Gadd's Rush was about $1\frac{1}{2}$ miles N. of Brady's claims, and about 50yds. W. of the watercourse. The sinking was from 17ft. to 25ft., and it was thought to be a continuation of the lead from Windlass Hill. Some of the men got fair prospects, but not sufficiently good to pay for cartage of dirt to the well for washing. This rush was worked intermittently.

Hospital Gully and Deep Gully, were two small gullies behind Hospital Hill, W. from Brady's Gully. A 13-oz. nugget was found in the latter, but nothing else of importance at this side of the field.

PLIOCENE LEADS.—N. of where Brady's Gully runs on to the Salt Creek Flats there is a tableland of drift, known to diggers as "made ground," similar in character to that of Para Wirra, Barossa, Echunga, and other parts of the main range. It is most probable that gold will be found by prospecting it. Work has been done here and "colors" are said to have been obtained, but operations were suspended, as no payable results were quickly forthcoming. This drift extends N. towards Mount Victor, in the neighborhood of which there are gravel-capped rises indicating its presence. It may also pass under the Salt Creek alluvial flats. In 1887 several shafts were sunk, on the recommendation of the Government Geologist, commencing at a point near Salt Creek, where the bedrock was met with about 10ft. from the surface, and extending W. across the plateau. These shafts appear on inspection not to have been bottomed, but to have been abandoned on reaching a hard calcareous cement and conglomerate; the question, therefore, as to the existence of a lead of gold is still undecided. The finding of deep ground and payable gold here would be a matter of great importance, as there is a large area to the N. of similar country.

The ranges near Bumbumie, to the E. of Brady's Gully, consist of gneiss, mica schist, granite, &c., and these are penetrated by granite dykes and masses, and probably by diorite, as this and other hornblendic rocks are seen in the creeks. The calcareous slates and limestone dip away from the granite and metamorphic rocks at a low angle. Some of the slates contain boulders and pebbles of quartzite embedded in them. A large portion of the nuggets found on this field show no sign of having been derived from quartz reefs. Most of them are partially coated and have their hollows filled with travertine limestone; ferruginous limestone rock and iron oxide is frequently found adhering to them. The veinstones found in the district consist chiefly of quartz; iron ore and limestone also occur, either combined or separately. Auriferous washdirt, cemented with carbonate of lime, is also found ;

it is a hard rock, and the gold is not visible on the surface. Payable gold may sometimes be passed over if the cement is not carefully examined. There is also a probability of small nuggets becoming completely coated with the travertine limestone, and so being passed unnoticed. This material may be removed from the gold by placing it in a solution of spirits of salt, or by heating it in a fire and converting the carbonate of lime into quicklime.

The Government purchased 27 nuggets, aggregate weight 240ozs., suitable for exhibition purposes, and these were displayed at the Jubilee Exhibition of 1887, together with a quantity of the finer alluvial gold.

Vigorous work was in progress for about a year, and then the place was practically abandoned, save for a few fossickers, of which some remain even to the present.

In 1897 the then Minister of Mines subsidised about 70 prospectors, in order to search for gold outside of the small area, about 1 square mile, to which the rich deposits seemed confined. Their work was done mainly to the N. of Brady's Gully, but no good results were obtained.

It is difficult to estimate the amount of gold obtained on this field, but from first to last it may safely and moderately be put down at about £300,000 worth; and it seems strange indeed that, so far, no other finds have been made in this district, where such a vast area of similar country exists.

TEETULPA REEFS.—There are two sets of reefs or veins in this district—one traversing the bedrock E. and W., and the other striking in a meridional direction. They are composed of veinstone consisting of quartz, gossan, carbonates of lime and iron, hematite, brown iron ore, and iron pyrites. Carbonate of bismuth and lead, with traces of copper ore, have also been noticed. The greater part of the work done was on the N. and S. reefs. These have a strike ranging from N. 10° to 15° and 20° W.; the underlie is steep, and inclines from 70° to 80° to the E. They are well defined, and are of considerable width in some of the claims, and have well-defined walls; they run parallel to one another in groups of three or four. A number of small companies were formed, numerous shafts sunk, and a great deal of ore raised. As a rule the gold is very fine, and, owing to the ferruginous nature of the stone, is very difficult to see. In the Victoria claim, however, in Strawbridge's Gully, a pocket consisting of quartz and gossan has been found containing very rich specimens of a wiry filamentous gold of a peculiar and remarkable character. Other claims in which gold was seen are Meache's Ironclad, Nos. 1 and 2; and on the Ironclad belt of reefs the Jubilee, Blue Star, Warrior, &c. Owing to the nature of the stone its value cannot be judged merely by examination, and as regards assays and hand crushings, the former are often deceptive and the latter test is generally only sufficient to show that gold does or does not exist in the small samples tried.

A small battery was erected between Brady's and Goslin's gullies, but the gold-saving appliances were very crude, and the results were unsatisfactory.

TORRENS RIVER.—For some months in 1887 a number of men worked for gold at a spot about 2 miles above the gorge, where the Sixth Creek comes in, and also along the bed of that creek. Alluvial gold was found in the river by sluicing on section No. 6154, near the Gumeracha bridge, and on sections Nos. 6074, 6060, 6113, and for some distance along the river near Blumberg, and elsewhere. What portions will prove payable can only be ascertained by thorough work. The river is auriferous from its source to the gorge where it issues from the hills, and from thence it has probably carried gold down towards the sea. This can only be proved by testing the deep Tertiary deposits on the Adelaide plains.

TRENGOFF.—Situate about 1½ miles from Angaston, at the base of a large hill of marble, traversed by a dioritic dyke. The Inspector of Mines stated (1889) that at the point of intersection of the diorite and the marble there is a "blow" of

specular and oxide iron. There is a lode formation apparently fully 25ft. wide, and stones said to have been obtained at a depth of 30ft. showed free gold in the vughs. The appliances were inadequate to keep the water under.

TREVUE.—Four miles E. from Gawler. The Inspector of Mines reported in 1889 that on the top of a hill of clayslate there had been sunk a shaft disclosing a reef, carrying a little gold, which runs N. and S. and underlies W., but the strata are contorted. A shaft, 90ft. deep, cut several quartz leaders, mostly mineralised, and a crosscut was put in the bottom of the shaft, but did not cut the reef.

UNION JACK.—Adjoining the Stars and Stripes, about 1 mile N.W. from Mount Grainger. A quartz vein formation of a favorable character, from 2ft. to 4ft. wide, has been explored by a shaft 50ft. deep and an opening 6ft. deep, from which two small parcels of ore have been treated at the Petersburg works, returning 3dwts. and 6dwts. per ton respectively. The country rocks are slate and sandstone. The reef justifies further testing, for which purpose small openings should be made along the line, to be followed by underlie shafts on any shoots of gold found. (I.M.R., 30-8-01.)

UNION JACK.—Adjoining the Ajax Reef, Waukaringa, on the N.

ULOOLOO GOLDFIELD.

This auriferous area is situated about 20 miles N. of Hallett. It was discovered in 1870-1, and the first workings were on section No. 650, on what is known as the White Lead. Workings were also opened on Noltenius's Creek, section 673, and were followed down on to Coglin's Creek. Work was carried on in an intermittent manner, and it has been impossible to ascertain the total quantity of gold obtained; but £18,000 worth was, up to August, 1886, transmitted through the post office at Hallett. No quartz reefs or veins have been worked, the gold found being alluvial, and generally coated and mixed with iron ore. Along Coglin's Creek the gold is found in two formations—alluvium of the present creek, and in the old creek bed or deep lead, following the creek and sometimes crossing it. In the present creek the sinking was only a few inches in depth, whilst in the deep lead it ranged from 20ft. to 30ft. Both the lead and the creek follow the strike of the rocks, viz., N. and S. Some parts of the diggings were fairly rich. Attempts to prospect some of the deep leads have been frustrated by the great influx of water at about 40ft., but this could be overcome by pumping. The absence of water, except in the Ulooloo Creek, is a drawback to efficient prospecting, and another matter that is against the success of the field is that the area of Crown lands is small and is surrounded by freeholds. The neighboring country is strongly auriferous. With regard to results obtained by miners, the Warden of Goldfields reported on July 5th, 1886, that Ellis and Carpenter had washed 11ozs. of gold from 17 loads of dirt; and that Herbert's party had washed 5ozs. from two and a half loads. The Government prospecting party got various amounts of gold, ranging from 2dwts. up to 13dwts. per load. The gold found is coarse and nuggety, and some but little water-worn.

The rocks of this field consist of clay and calcareous slates and limestones, with quartzose, sandstone, and sandstone bands. They contain numerous reefs and veins of quartz and ironstone, and the surface is frequently strewn with fragments of these veinstones.

About 2 miles N.E. a small patch of alluvium, named *Twigham*, was worked for gold.

In 1897 some subsidised prospecting was done in the vicinity, but no fresh discoveries were made.

URAILLA.—*Vide* "Bolland's Uraidla," page 209.

VICTORIA GOLD MINE.—Ten miles E. from Adelaide, in the neighborhood of Montacute. Was opened by a company in January, 1846. *Vide* pages 7 and 17. *This was probably the first gold mine worked in Australia.*

WADE's (gold lease No. 988).—About 1 mile N.W. of Mount Grainger. An outcrop of siliceous material can be traced for fully 200yds. in length over some small rises. It is of considerable width, but no work has been done beyond a few surface openings, the deepest being 5ft., where the formation is composed of iron-stained sandstone and quartzite, with seams and veins of quartz throughout. The inspector was informed that gold had frequently been seen in breaking the surface croppings; but a sample taken gave a nil return. Further prospecting was recommended. (I.M.R., 16-2-00.)

WADNAMINGA GOLDFIELD.

The Government Geologist reported fully on this field in 1898. The original Wadnaminga Goldfield Reserve, an area of 36 square miles, is crossed in a N.E. and S.W. direction by three main ridges of elevated country, and partially by two other detached ranges. These are intersected by creeks trending from N.E. to S.W. into wide alluvial flats. The highest elevation of the hills forming these ranges is from 300ft. to 350ft., the general average height being about 200ft. The strike of the rocks conforms roughly to that of the ranges. In the N.W. corner of the reserve the rocks consist of mica slates and sandstones, clayslates, calcareous clayslates and flags, and limestones, striking from E. 30° N. and W. 30° S. to N.E. and S.W., and dipping vertically and S. The lowest beds are the most micaceous. The limestone, which is crystalline and dolomitic, is interstratified in beds of irregular thickness. The slates and flags, as well as the limestone in this vicinity, contain scattered boulders and pebbles of various varieties of granite, quartzite, sandstone, slate, limestone, and other rocks, sometimes forming a true conglomerate. Some of these boulders are very large, and, judging from their size and mode of occurrence, have probably been transported by ice action at an early period in geological history. The country rocks in which the two main groups of auriferous lodes occur are described in connection with these groups. In the S.W. portion of the reserve there are extensive beds of sandstone, calcareous sandstone, and quartzose sandstone interstratified with clayslates and calcareous slates, limestone, micaceous slates, and sandstones, which have been thrown into an anticlinal arch, trending N.E. and S.W. In the S.E. corner of the reserve calcareous sandstone beds are interstratified with mica slates and beds of limestone; they strike N.E. and S.W., and dip S.E. at angles of 45°. Further to the S.W. similar beds strike W. 20° S., and dip vertically and at high angles in a N. direction.

A rich auriferous quartz vein was found in 1888, and called the Eiffel Tower; and afterwards the Victoria Tower, Oulnina Tower, Countess of Jersey, and other lodes were discovered. Another line of auriferous lodes, the Birthday (Milo) and the Great Eastern and the Virginia, was found in the following year. Work on various claims was carried on intermittently and not altogether satisfactorily for a few years; but payable results were obtained from the Birthday, Great Eastern, and Virginia. In an earlier report the Government Geologist gave a statement of gold obtained from 1889 to September 19th, 1891, as furnished by F. D. Johnson, showing that, as far as known, 787ozs. 7dwts. 10grs. of gold (including specimens) had been obtained from 47 tons 7cwts. of stone. It must be noted that this is by no means a full record.

EIFFEL TOWER AND VICTORIA TOWER GROUP.

The veins consist of quartz, brown iron ore, hematite, and gossan, having a very low underlie—10° and 15° to 30°, seldom exceeding 45°. The walls generally are from 2ft. to 4ft. apart, and enclose, besides the quartz, sections of the country rock. The lodes cut across the strata, and small subsidiary veins meet them at nearly right angles. The principal veinstone is quartz, generally of the white opaque variety, also tabular and laminated; brown iron ore, hematite, gossan, calcspar, and spathic iron are also often present.

Travertine limestone coats the different veinstones and the country rock along the vein outcrops, but is found to die out as they are followed down from the surface.

Indicator Veins.—In connection with the quartz lodes there are small subsidiary veins, sometimes consisting of quartz, gossan, and ironstone, at others merely fissures, cutting the lodes nearly at right angles. These are locally known as "indicators," as indicating the presence of gold. Where the lodes are cut by them rich pockets of gold have been found to occur. So far as observed these indicators are in the hanging-wall only, and do not pass through the footwall; but there is some uncertainty on this point. If they cut through the lode completely they must have been formed subsequently to the deposition of the lode; if they only penetrate one wall they have probably been formed simultaneously with the fissure in which the lode matter was deposited.

The gold occurs in the solid quartz, and in the lamination of the quartz; in ironstone and gossan; and has also been observed in the travertine limestone deposit in lumps or nuggety pieces, flat crystalline plates, and fine particles. Pyrites is present in the veins near the surface, and will doubtless become more plentiful below water-level and replace the iron oxides. Galena and carbonate of lead ore are disseminated through the veinstone of all the lodes to a greater or less extent, and carbonate and other ores of copper occasionally occur.

Carver's Claims.—Gold sections 153, 221. No permanent body of veinstone has been discovered, but rich stones have been got out and alluvial gold has been worked near the principal shaft in shallow ground. A quartz lode, with iron oxides and carbonate of iron, 4in. to 12in. thick, is in the vicinity, and other vein outcrops occur. More prospecting advisable.

Gold Sections 156, 157, and 236.—Cuttings and shallow shafts have disclosed quartz reefs and small veins; favorable to the presence of gold.

Oulnina Tower.—Gold section 215. A strong quartz outcrop extends 374ft. on this claim, with a variable strike, and is 2ft. to 5ft. wide; main shaft 188ft. deep, on an average incline of 16° W. The lode splits into two veins at the bottom of the shaft, but in No. 2 shaft it is 2ft. thick. It is stated that a ton of stone in one instance yielded 30ozs. of gold; later 12 tons gave 12dwts. of gold per ton.

Victoria Tower.—Gold sections 206, 243, 244. A curved line of outcrop extends 800ft. The main shaft (inclined) reached water at 335ft., and has a total depth of 445ft. and the lode contains much pyrites. Indicator veins $\frac{1}{2}$ in. thick traverse the lode, and where they have intersected it is said coarse gold has been found. The quartz has a highly favorable appearance for gold. Surface deposits of gold were being worked to the N.W. of the main shaft. The lode is large and persistent and of an unusual average thickness, and has been proved to contain rich specimens of gold. If opened up properly and worked on a larger scale it should be a successful mine. It is worth noting, with regard to the future working of this mine, that vertical shafts would be much cheaper and more economical than inclined shafts. As an example—the main shaft has been sunk 335ft. to water-level; a vertical shaft to reach the same point would only have to be sunk about 155ft. from the surface. The mine was worked for five years, from 1889 to 1894, by a Victorian company. A dry-crushing plant was erected during that time, and 250 tons are stated to have been treated, yielding 7dwts. per ton. Since 1894 little work has been done. Five tons 15cwts. raised and treated at the Petersburg Government Cyanide Works in March, 1898, yielded 4ozs. 19dwts. of gold, valued at £14 13s. 6d. An ex-manager furnished the following information to the Government Geologist:—

In 1890.....	15cwts.	yielded	128ozs.	13dwts.	10grs.	of gold
In 1891.....	2 "	"	60 "	0 "	0 "	"
In 1891.....	10 "	"	5 "	0 "	0 "	"

A specimen of gold in quartz weighing 8ozs. 14dwts. was found on the surface. Mr. Jessop states that 10 tons treated at Footscray, Victoria, yielded 52ozs. of gold. Twenty tons treated at the Countess of Jersey Battery, Wadnaming, yielded

9ozs. 18dwts., and 3 tons at the same battery yielded 11ozs. 6dwts. of gold. Three average samples of coarse tailings remaining from the treatment by the dry-crushing process, taken by the Government Geologist, yielded gold and silver as follows:—

No. 1.....	Gold, a trace	per ton; silver, a trace	per ton.
No. 2.....	" 4dwts. 1gr.	" " 2dwts. 11grs.	"
No. 3.....	" 4dwts. 23grs.	" " 3dwts. 7grs.	"

Countess of Jersey.—Gold section 245. There are two outcrops, and the main shaft goes down 306ft. on the underlie 29° S. The lode varies from 3in. to 3ft. in the 214ft. level, and from 6in. to 9in. in the bottom. Walls well defined; no gold found but in the vicinity of indicator veins. On the lesser outcrop two shafts have been sunk. A strong cross vein runs at right angles to the strike of the main lode. Operations have been principally in search for gold specimens. A Victorian company worked it from 1891 to 1894. A battery was erected 2 miles from the mine, and about 300 tons of stone treated; there is no record of the returns of gold from this parcel, and little is known regarding results obtained generally. In 1891 2 tons yielded 16ozs. and 11ozs. respectively. (Johnson).

Golden Tower.—Gold section 247. The reef runs E. and W., and outcrops 440ft., dipping S. at 45° on an average. The main shaft is down 109ft. on the underlie, which is 44° S. and 48° in the lower part. The quartz is 6in. thick near the surface and increases to 18in.; walls well defined and 3ft. to 4ft. apart. In No. 2 shaft the lode is 18in. thick at the surface and 3in. thick at bottom, 32ft. Quartz laminated, and contains galena and green carbonate of copper. Gold visible in the slate casing, in the quartz, and in the travertine limestone. No. 3 shaft, 41ft. inclined, has the lode in the bottom 18in. thick, and 3in. to 6in. at the surface. The lode looks favorable for permanency in depth and for the presence of gold, of which metal very rich specimens were obtained in the outcrop; every inducement to sink on the lode to a greater depth.

Taylor's Claim.—Gold section 249. Several shafts have been sunk on a quartz outcrop extending for a distance of 370ft. It strikes W. 30° S., and has an average dip of 45°. The thickness of the vein varies from 3in. to 12in. The quartz is laminated and glassy, and is associated with a calcareous and slaty formation. The footwall is well defined.

In 1898 9 tons 9dwts., treated at the Petersburg Cyanide Works, gave a return of 14ozs. 11dwts. 22grs. of gold, valued at £51 7s. 6d., the average extraction being worth 108s. per ton.

Golden Record (New Golden Record).—Gold section 262 (late *Earl of Jersey* and *Eiffel Tower*). The lode strikes N.E. and S.W., and dips 15° to 24° S.E. The veinstone, which consists of laminated and crystallized quartz, with pyrites, galena, and iron oxides, varies from 3in. to 18in., and contains rich shoots of gold. Extraordinarily rich gold has been found here, and it is reported that a parcel of ore treated at Kapunda yielded 1oz. 19dwts. per ton. A vertical shaft 15ft. deep has been sunk to the lode, which has then been worked by winzes and drives for a distance of 90ft. Besides these workings the original Eiffel Tower Syndicate and the Earl of Jersey Syndicate had previously sunk shafts on the inclination of this lode to the S.W., and a vertical shaft 110ft. to cut it. No information as to the result of these operations is available. The lode is of small size; it contains, however, rich shoots of gold which should be followed down and prospected at deeper levels.

The Inspector of Mines reported in April, 1900, that the operations then were confined to the new shaft, situated towards the E. end of the workings, which had been sunk to the depth of 133ft. on the S.E. underlie, the distance from the bottom to the surface vertically being about 50ft. The reef varies in thickness from 18in. to a small vein, and consists of quartz containing pyrites, also a little galena and iron, the country rock being slate. Small diagonal quartz seams occur in the hanging-wall, which at times intersect the lode, and the points of contact are usually rich

in gold. Lehman's shaft is sunk to the depth of 160ft., the underlie being very flat to 100ft., thence the dip is steeper. The lode near the surface is fully 2ft. thick, and is composed of iron-stained laminated quartz, containing pyrites and a little galena. From 60ft. it contracts to from 12in. to 3in. The gold-bearing shoots start from the surface and dip E.; four of these have been exposed, with almost barren ground between them. A considerable amount of stone, some of which gave high results, has been taken from this shaft; also in other parts of the mine a considerable amount of work has been accomplished, chiefly at the shallow levels, all having a similar appearance, and with similar results. Doubtless, if the new or present working shaft were continued, some of the shoots previously worked further W. would be encountered, and the value of the unexplored ground determined. (I.M.R., 28-4-00.)

Three parcels were sent to Petersburg Cyanide Works. One of these, comprising 5 tons odd, was bagged from discarded stone, the yield being very low; the total, however, treated at the Government plant was 24 tons 15cwts., which returned 33ozs. 16dwts. 17grs. of gold valued at £122 4s. 9d., the average extraction being worth 97s. per ton.

GREAT EASTERN, BIRTHDAY (NEW MILO), AND VIRGINIA GROUP.

The lodes have usually two well-defined walls, and vary in width from 3ft. to 5ft., the veinstone being sometimes on the hanging-wall and sometimes on the footwall, with occasional splits, and dip on the average 25° S. The indications suggest that the lodes will be found to exist to a considerable depth; the country rocks are clayslates, calcareous clayslates, micaceous slates and sandstone, micaceous and argillaceous limestone, and massive limestone.

Gold Section 226.—A quartz lode extends 300ft., striking W. 10° S., and dipping S. 28°; thickness varies from 6in. to 12in. Shallow workings and a 30ft. sinking. No record of stone treated.

Great Eastern.—Gold section 150. The quartz lode just above mentioned continues across this claim for a distance of 800ft. A good deal of work has been done, and the veinstone has been proved rich in places. It consists of quartz and iron oxides, with traces of galena. In January, 1898, 6 tons treated at the Government Cyanide Works yielded 10ozs. 16dwts. 9grs. of gold; February, 11 tons gave 17ozs. 9dwts. 3grs.; and March, 4 tons 16cwts. gave 3ozs. 5dwts. 9grs. of gold, the total being 21 tons 16cwts., which yielded 31ozs. 10dwts. 21grs. of gold, valued at £109 15s. 5d., the average extraction being worth 100s. per ton.

New Milo (Birthday).—Gold sections 225, 238, 151, 209, 212, 257. The E. lode outcrop extends 330ft. E. and W., from 2in. to 6in. thick, dipping S. at a low angle. Two prospecting shafts have been sunk 30ft. deep on the underlie; in the E. shaft the lode at bottom is 12in. thick, and consists of quartz with pyrites and iron oxides; in the W. end it is split into two veins, which will join in depth.

The W. lode outcrop extends 370ft., dipping 20° S. There are three shafts, inclined, sunk to a considerable depth, viz., water shaft 395ft., Nutman's 495ft., and Golden Point shaft, crossed by Nutman's; and a good deal of stoping has been done, some of the stone being very rich. Two samples of quartz and pyrites taken by the Government Geologist assayed respectively—gold, 3ozs. 6dwts. 23grs., silver, 15dwts. 23grs.; and gold, 25ozs. 7dwts. 23grs.; silver, 10ozs. 21grs. per ton. The mine was worked more or less regularly until August, 1897. The following are official gold returns:—

		Tons.	Cwts.		Ozs.	Dwts.	Grs.
May, 1892	ore,	15	0	gold returned,	12	10	0
" 1893	"	12	3	"	83	0	0
1893 to 1897	"	9,460	0	"	4,240	12	0
1893 to 1897	tailings (cyanide)			"	6,138	12	0

The average value of the bullion has been £2 18s. 6d. per ounce. The property was afterwards worked for a time by Messrs. Deeble, Rees, and James.

In any future working of this mine the use of vertical shafts will be found more advantageous and economical than inclined shafts, both for working and draining purposes. The extension S. of the lode can also be best prospected for by vertical shafts.

In March, 1907, tributers raised a crushing from the old workings, and sent 13 tons 8cwts. to the Petersburg Cyanide Works. This returned 15ozs. 9dwts. 18grs. of gold, valued at £52 3s., an extraction per ton of 1oz. 3dwts. 2grs.

Virginia.—Gold sections 207, 208, 259, 268. Discovered in 1890. The outcrop of the lode has been worked over 980ft. It strikes W.S.W., and dips at low angles to the S. The veinstone has varied from a few inches to 2ft., and consists of quartz, with iron pyrites, galena, and carbonate of lead. A quantity of ore treated returned from 2ozs. to 2½ozs. per ton, from the proceeds of which a battery was bought and working expenses paid for 12 months. The mine closed down in 1895. Official returns show that the ore treated in 1892 totalled 545 tons 5cwts., yielding 1,490ozs. 10dwts. of gold; that a six months' return to June, 1893, gave 629ozs. 2dwts. 5grs. for 923 tons of stone; and a six months' return to August, 1894, showed a yield of 1,069ozs. from 1,284 tons of stone.

A parcel of 2 tons 16cwts. sent to Petersburg Cyanide Works in August, 1906, returned 5ozs. 12dwts. 12grs. of gold, valued at £19 8s. 4d., a yield per ton of 2ozs. 0dwts. 4grs., equivalent to 138s. per ton; and 751 tons of sand were cyanided on the mine for 102ozs. gold bullion.

MISCELLANEOUS MINES.

North and South.—On block 152 a quartz lode runs N. 13° W. 300ft., dipping W. 25°, and varies from a few inches to 2ft. Main shaft 166ft., following the inclination of the lode. Three other shafts sunk. The mine was at one time worked by the New Milo Company, and it was reported that rich specimens of gold were found. An average of 1oz. per ton was returned on treatment of a 20-ton parcel of ore by the Milo battery.

Frenchman Lode.—Gold sections 154 and 155. The main outcrop is traceable 560ft.; strike E. 30° N.; dip 60° N.; average thickness 1ft., but in one place 10ft., where apparently there are two or three separate veins. The lode is favorable for gold. It consists of quartz, iron oxides, and gossan, with traces of copper; talc and steatite occur in connection with it. There are other veins on the block worth prospecting.

John Bull Claims.—Numerous prospecting pits and shafts have been sunk here on quartz and ironstone veins, which are of a character favorable to the occurrence of gold. The locality is a likely one for the surface prospector.

South Australian Broken Hill.—At these old workings there are shallow vertical and inclined shafts on veinstone and lode formation, consisting of laminated quartz, oxides of iron, gossan, and carbonate of iron, containing galena, carbonate of lead, and copper ore. The lode is small and irregular. Three assay samples taken returned—(1) 19dwts. 14grs. gold and 17ozs. 1dwt. 9grs. silver; (2) 1dwt. 8grs. gold and 6dwts. 20grs. silver; (3) 3dwts. 6grs. gold and 1oz. 1dwt. 20grs. silver per ton. Samples of carbonate of lead returned silver at the rate of 36ozs. 11dwts., 42ozs., 8ozs. 10dwts., 8ozs., and 11ozs. respectively per ton, besides a trace of gold. The silver ore seems to have run out in depth. It is possible that the lode may increase in size at a greater depth; it is worth further prospecting.

Old Workings.—There is a strong lode outcrop of hematite, limonite, quartz, and other siliceous veinstone S. of No. 261, the thickness varying from 2ft. to 4ft. Samples assayed showed a trace of gold only. Deeper prospecting required.

Klem's Claims.—These are situated in a range running across the N.W. corner of the goldfield reserve. Shafts have been sunk on a siliceous, calcareous, and ferruginous formation containing carbonate of iron, quartz, and galena. An assay gave a trace of gold, and silver 19ozs. 5dwts. 11grs. per ton.

North-Eastern Syndicate.—Prospecting on a lode 1ft. to 2ft. thick, well defined, resembling in composition the large indicator vein on the Countess of Jersey Mine. A sample of the pyrites gave of gold a trace and of silver 4dwts. 21grs. per ton.

Smith's.—Situated near the Gorge, S. of Wadnaminga. A sample taken from a vein of brown iron ore assayed—gold, 14dwts.; silver, 8dwts. per ton. Surface gold would probably be found in this locality.

There are two batteries on the field, viz.:—The New Milo battery of 10 stamps, with cyanide vats, &c., and the Countess of Jersey, of 10 stamps (removed in 1907 to the Homeward Bound Mine, near Mannahill), with berdan pans. The New Milo battery is situated on gold section 225. The tailings collected during the time it has been at work are now being retreated by the agitation cyanide process. Water for crushing purposes is pumped from a well $\frac{1}{2}$ mile S.W. of the battery. Water is also procured from the mine for that purpose. The Countess of Jersey battery, situated about $\frac{1}{2}$ mile W. from the township, has not been at work for some years. An excavated dam and a well have been sunk to provide water for crushing; these are still in good order, and water is obtainable from the latter. The Virginia battery, which was erected on gold section 207, has been removed.

Gold has been obtained from alluvial gullies and surfacing at several places along the Eiffel Tower and Victoria Tower group of lodes, viz., on gold sections 153, 156, 221, 236, 243, 248, 261, 262, 265, 266, and W. along the same range of hills. Except where the gullies are narrow and well defined, it has only been found in small and not payable quantities. This is doubtless owing to the wide extent of the alluvial flats and plains rendering it a difficult matter for prospectors to locate and follow the "runs" of gold, which there is every reason to infer exist beneath them. (In 1897 some prospectors were subsidised by the Hon. Minister of Mines, but no fresh discoveries were made.)

The number of auriferous quartz lodes on the Wadnaminga Goldfield so far opened is large; as a general rule, although small in size, they are persistent in dip and strike, and have well-defined walls. So far as followed down they have in no instance been found to die out; in some cases they have thinned out considerably, but this thinning out may be, and most probably is, only a temporary falling off in thickness, and should not discourage prospecting at greater depths. The auriferous specimens found from time to time in many of these lodes have been unusually rich, and are sufficiently encouraging to warrant more energetic and systematic prospecting and mining.

With the exception of the New Milo and Virginia, none of the mines hitherto opened up can be said to have been systematically worked. (Government Geologist, 10-6-98.)

Only intermittent operations, and those on a small scale, have taken place here during the last few years.

WALTER-OUTALPA.—Situated $1\frac{1}{2}$ miles N. from Walpurata Springs, Outalpa. In June, 1895, the Inspector of Mines reported on the property held. A vein composed of ferruginous quartz with pyrites in small quantity, 3in. to 15in. wide, had been opened by a shaft 30ft. deep. It was reported that stone from the surface assayed 2ozs. to 3ozs. per ton. Samples from the stone taken from the shaft for test by the Government Assayer gave 1dwt. gold and 1dwt. of silver per ton. In July, 1897, the Goldfields Warden brought for test two samples from the bottom of one of the shafts, which assayed respectively 7ozs. 6dwts. and 4ozs. 13dwts. of gold per ton. The mine was being worked by a Laura syndicate. Three shafts have been sunk.

WALLACE'S GULLY (Yudnamutana district).—Alluvial was worked for six months by the discoverer alone, before the place was known to other prospectors. It was said that he got nearly 100ozs. in that period, the bulk being nice rough gold of a superior quality, and that the largest nugget weighed a little less than 2ozs.

WALLAROO UNITED.—Situated E. of and adjoining the Ironclad Mine, Mount Grainger. It has been worked by a number of trial pits, cross trenches, and two shafts, for a distance of about 200yds. in length. Two shafts have been sunk, one to 108ft. and the other 98ft. from the surface. The latter discloses a clayslate formation from 1ft. to 2ft. in width, striking E. and W. It contains several small seams and bunches of ferruginous matter, which carry fine gold from the surface to the present depth. At the bottom a crosscut has been made 35ft. from the shaft, and it is anticipated that in another 20ft. a second formation, indications of which appear on the surface, will be passed through. The deeper shaft could not be examined, but it is only a short distance from the other one, and passes through similar material. (I.M.R., 30-8-00.)

WARDEN GOLD MINE.—Locality, near Warrina Railway Station. A discovery of auriferous quartz, which at a shallow depth changed into copper-stained lode material, was made by the Government prospecting party in 1898, and was afterwards included in the holdings of the Copper Top Company. *Vide* page 45.

WATERLOO CLAIM.—The Inspector of Mines visited this claim in May, 1889, and reported that two shafts had been sunk on section 4232, near Hahndorf. A strong quartzite reef contains a fair percentage of slightly auriferous pyrites. The hanging-wall is sandstone and the footwall slate, both walls well defined.

WATERFALL GULLY.—The Inspector of Mines, in November, 1894, inspected a large quartz lode outcropping and traversing sections 985 and 1115, and striking S. 10° W. A private assay certificate showed a return of 5ozs. 4dwts. 12grs. of fine gold and 1oz. 6dwts. of silver per ton of ore.

WOODHOUSE ESTATE.—The report upon sections 1150 and 1151, Onkaparinga, in 1890, expressed the opinion of the Inspector of Mines that there was no gold in the samples tested. A little alluvial gold was afterwards found.

WATERVALE.—The locality, near Watervale, was hilly, and numerous quartz and ironstone reefs traverse the district. The Government Geologist reported in 1897 that four shafts had been sunk in an ironstone formation running N. and S., and having no defined walls. Quartz outcrops in the vicinity and the rocks are favorable to auriferous deposits, though not necessarily in a payable quantity. He was of opinion that the prospects did not justify further shaft-sinking.

WEST ALMA.—Gold mining leases No. 437A and 552, Waukaringa, adjoining the Alma Extended and the Day Dawn. There is a lode running E. and W., 3ft. wide, consisting of quartz intermixed with ironstone; and two shafts following the underlie of the lode have been put down, one 343ft. and the other 70ft. The country rock is sandstone. The manager reports that sinking the deeper shaft has been suspended pending the erection of machinery to cope with the water, but at the bottom the lode had considerably improved, and was 4ft. thick. The amount spent on plant and construction to date is £469 15s. 5d., and wages and material £1,738 11s. 4d.; total, £2,148 6s. 9d. (March, 1890.) Since then it has ceased working. The average of samples taken from water-level to surface by Messrs. Gee and Grundy, in 1907, was 3dwts. 5grs. per ton.

WICKHAM HILLS.—Three shafts were sunk in the Wickham Hills, searching for a deep lead. One was put down 57ft.; a second, half a mile from the first, was sunk to 63ft., and bottomed on hard rock, dipping at an angle of 45°. Between these two a third shaft was sunk to the water-level at 107ft., but not bottomed. Small quantities of gold were found in shallow sinking on the sides of the hills; the discovery has not been followed up.

WINNININNIE.—Situated 14 miles from Mannahill Railway Station, formerly known as the Railway and Shepherd's claims. The company erected a Chilian mill. A good deal of costeaning and stoping was done on an outcrop, and the result obtained was good, some of the reef yielding at the rate of 7ozs. to the ton. The reef has a very low angle, following the bed of the strata, 15° to 20°. (1889.)

WEST WAUKARINGA.—Situated 3 miles W. from the Alma. A considerable quantity of work has been done, and the Inspector of Mines reported in 1889 that the regularity of the reef formation and its proved gold-bearing character warranted testing the property at greater depth.

In 1907 samples taken by Messrs. Gee and Grundy assayed—Tailings at site of Huntingdon mill, 1dwt. 8grs.; ore at grass, 1dwt. 3grs.; outcrop near Salt Creek, 23grs.; ore at grass near main shaft, 1dwt. 10grs.

WONNA.—*Vide* GOLDEN POINT, page 221.

WOODSIDE MINES.

Bird-in-Hand.—Situation, section 5278, Onkaparinga. It has three lodes bearing N. 10° E., with an underlie of 40° E. Their width varies from 1ft. to 8ft. The country rock consists of decomposed schist, with bands of sandstone, and the veinstone associated with the metallic minerals is quartz. Seven shafts have been sunk, one to a depth of 341ft.; the drives and levels extend for about 4,000ft. in length. The water-level was reached at 90ft. The quantity of stone raised (1887) equals 17,014 tons, and the smelted gold obtained 6,079ozs., of the value of £18,642 15s. Stone taken from the stopes between the 210ft. and 275ft. level gave 1,544ozs. of smelted gold from 3,183 tons of quartz. The gold appears in shoots apparently perpendicular to the vein. This mine was being worked in 1887, and machinery, consisting of a 50-inch cylinder beam-engine and 18in. pumps, had recently been erected. The Inspector of Mines in 1889 reported that the mine had produced since starting 8,860ozs. of gold by the treatment of 21,000 tons of lode formation, that from the bottom level producing on an average 13dwts. per ton. The mine was comparatively speaking shallow, and there was encouragement in the fact that the length of payable ground increased with the depth attained. Only one of three parallel reefs had been worked to any extent; and there was not the slightest doubt of permanency; they should be worked profitably down to a depth of 2,000ft. The Victoria shaft should be continued down to 600ft. before the reef was touched. Mr. Scarfe, the secretary, supplied the following information:—The Victoria vertical shaft is 350ft., main shaft vertical 410ft., and others of shallower depth, part on the underlie. The length of drives is about 5,500ft. The gold occurs in shoots, and 21,487 tons of material treated gave 9,017ozs. smelted gold. The value of the machinery on the mine is estimated to be £17,271, and of the gold raised £26,408 0s. 7d. Work partially stopped pending reconstruction of the company. (1890.) The Government Geologist inspected the property in March, 1897, and noted the great width of the reef—4ft. to 8ft.—its friable nature, and the length of the shoot of auriferous quartz, which appeared to be increasing as depth was made. The average of 13dwts. 5grs. per ton from 4,453 tons might be taken as a fair indication of the value of the reef unworked below the 350ft. level. Continued sinking of the Victoria shaft and opening levels at each 100ft. is essential for development, and with economic mining and employment of the most improved method of extraction of gold, the mine should become payable. In June, 1897, the Woodside Consolidated Syndicate ceased working here.

A large quantity of tailings resulting from the above crushings, which were left untreated after the battery ceased working, were at a later date treated by McArthur and Co., who cyanided 10,605 tons for a return of 1,241ozs. 16dwts. 17grs. of fine gold. Good extractions were obtained in the treatment of these tailings. At various times trial parcels have been forwarded to the Government Battery and Cyanide Works at Mount Torrens, and 154 tons 11cwts. treated returned 48ozs. 6dwts. 2grs. of gold, valued at £248 5s. 2d., the average yield being worth 32s. per ton; this ore came from various places. A parcel of 14 tons, being alluvial, taken from near the outcrop, yielded 1dwt. per ton.

Bird-in-Hand Extended.—Locality, section 5250, hundred of Onkaparinga, 2½ miles E. from Woodside. It was opened many years ago, but owing to want of

funds the work was discontinued. Gold was frequently seen in the stone, but none of it was crushed. There is one lode with a N. and S. strike; it is 20ft. wide, and is a continuation of the reef in the Bird-in-Hand property. The ore is ferruginous quartz, which on assay yielded at the rate of 17dwts. to 1oz. of gold per ton. It occurs in a large broken reef, consolidating under foot; about 50 tons of ore was raised. The workings consist of one shaft sunk to a depth of 100ft., and drives extending 250ft.

Brind.—Locality, W. side of section No. 5256, hundred of Onkaparinga, adjoining the Bird-in-Hand Mine. The reef at the S. end is 6ft. thick, and consists of white quartz, enclosing pyrites and some carbonate of lead in cavities. It strikes a little W. of N., and dips E. 25° N. at an angle of 57°. A shaft was sunk to a depth of 38ft. A portion of the surface was sluiced to a depth of 3ft., and 50ozs. of gold obtained. This included nuggets—among them one of 16ozs., and others of 9ozs., 7ozs., 5ozs., and 4ozs. (1887.)

One hundred and twenty-seven tons 16cwts. 3qrs. treated at the Mount Torrens Battery and Cyanide Works returned 44ozs. 18dwts. 4grs. of gold, valued at £153 Os. 8d., the average yield being worth 23s. per ton.

Eureka is on section 5259, hundred of Onkaparinga. It contains one lode bearing N. 24° W., and underlying 42° E. It is 6ft. wide and carries gold in quartz. The country rock consists of sandy schist, with bands of sandstone and dioritic slate. Four shafts were sunk, one of which is on the underlie of the reef, and is 229ft. deep. The drives and levels extend a distance of 500ft. The water-level was reached at 47ft. The ore occurs in shoots dipping slightly N. The stone containing free gold was treated by battery, and yielded an average of 12dwts. of gold per ton; but the reef, as it continues in depth, developed galena, blende, iron and copper pyrites. These yielded on assay from 2ozs. to 3ozs. of gold, and from 5ozs. to 10ozs. of silver per ton. Owing to the mine not having been regularly worked it is impossible to give the quantity or value of the stone raised in past times. (1887.) In 1894 the Eureka was taken up by an Adelaide syndicate, who sent stone and mullock for battery treatment, with, it was said, satisfactory results.

Four hundred and ninety-one tons 19cwts. 3qrs. treated at the Mount Torrens Battery and Cyanide Works returned 302ozs. 7dwts. 16grs. of gold, valued at £1,055 17s. 9d., the average yield being worth 43s. per ton. In 1897 Messrs. McArthur & Co. treated by cyanide process 2,894 tons of tailings which had been left at the mine; these returned 583ozs. 5dwts. 21grs. of fine gold.

Fountain Head is on section 5241, hundred of Onkaparinga. A vertical shaft was sunk 92ft., and at 74ft. a reef was struck. This, it was reported, gave rich prospects of gold, but an influx of water stopped the work. An underlie shaft was sunk on the same reef 27ft., and gold was found in the stone; two other shafts were sunk to depths of 85ft. and 42ft. respectively. The quartz is cellular, and contains iron pyrites; gold is visible on crushing, and also in the quartz. The width of the reef is about 2ft. 6in. An assay of a sample of the quartz, in which gold was not visible, yielded gold at the rate of 1oz. 6dwts. 3grs. per ton. (1883.)

Mint is on section 5259, hundred of Onkaparinga. It contains one lode bearing N.W., having an underlie of one in two to the N.E. The width varies from 1ft. to 3ft. Auriferous quartz occurs in patches, but a little fine gold is distributed through the mass of the ore. The average yield of gold from 30 tons was about 4dwts. per ton, exclusive of specimens obtained. The workings consist of two underlie shafts, the deepest about 60ft., and a drive 20ft. in length. Water-level is at 55ft. Very rich specimens were found in this mine at a depth of 40ft. on the footwall of the reef. They were lying on a ledge formed by the rock. Some of them contained as much gold as quartz.

Mount Charles.—Situated near Charleston. Some shallow excavations have been made in quartz reefs in this neighborhood. Nine tons 13cwts. 3qrs. treated at the Mount Torrens Cyanide Works returned 9ozs. 7dwts. 9grs. of gold, valued

at £35 15s. 4d., the average yield being worth 74s. per ton; also 80 tons 6cwts. of tailings were carted from the mine to the Government Cyanide Works and returned £88 13s. 3d. worth of gold, the value per ton being 17s.

Nest-Egg is on section 5297, hundred of Onkaparinga. A shaft was sunk 52ft. on a quartz vein about 4ft. wide. A vertical shaft, 84ft., in the direction of the underlie, was also sunk to 50ft., and connected with the first shaft by a drive. This passed through two other quartz veins. A main shaft was sunk 120ft. to strike the reef on the underlie. Owing to the quantity of water met with in sinking, operations had to be suspended. The underlie of the Fountain Head reef would probably be met with in sinking.

New Eclipse (also worked under the following names:—*Balhannah Surprise*, *Daisy Point*, *Little Swallow*, and *Le Hunte*).—Situated on section 4260, hundred of Onkaparinga. There are four shafts on the property, varying from 30ft. to 60ft. One hundred and eighty-nine tons 5cwts. treated at the Mount Torrens Battery and Cyanide Works returned 141ozs. 13dwts. 23grs. of gold, valued at £529 16s. 9d., the average yield being worth 56s. per ton.

New Era (also known as *Hillside*).—Situated on part section 5263 and 5267, hundred of Onkaparinga, about $2\frac{1}{4}$ miles from Woodside. There is one main reef bearing N. and S., and two spurs bearing to the N.E. The underlie is 1ft. in 3ft. to the E., and the width varies from 6ft. to 20ft. The stone consists of auriferous quartz, highly ferruginous, and has yielded from 4dwts. to 8ozs. of gold to the ton. About 14,000 tons of stone were raised and crushed, yielding gold to the value of £18,500. The veinstone associated with the metallic minerals is ferruginous silica, and the country rock consists of pipeclay, mica schist, sandstones, and diorite. The gold occurs in patches, but fine gold is distributed through the whole width of the stone, and in some places is found in the surrounding country. The best shoot is where the spur reef joins the main N. and S. reef, and dips to the N. about 5ft. in 100ft. One vertical and six underlie shafts have been sunk, the deepest being 120ft. There are two drives—one of 900ft. at the 112ft. level, and one of 100ft. at the 50ft. level. Water-level, 50ft. (1887). Subsequently two crushings of stone yielded 428ozs. 14dwts. 12grs. of gold. The following particulars were furnished by the manager:—There is one lode, striking nearly N. and S., averaging about 10ft. thick. No. 1 shaft is 180ft. deep, and No. 2 is down 90ft., both vertical; and there is a tunnel driven 700ft. from a creek, making the 112ft. level. The matrix of the ore is a much-jointed ferruginous silica, and the country sandy slate and diorite. The ore carried is an iron oxide, with occasional patches of oxide and carbonate of bismuth, in which the gold is richer. When this mine was first opened 30 tons of the stone gave 8 $\frac{1}{2}$ ozs. to the ton, and 160 tons 3 $\frac{1}{2}$ ozs. to the ton. Then the whole width of stone, sometimes 30ft. across, was put through for an average yield of 10dwts. The lode was stoped to the 211ft. level, when the water became very heavy; and after sinking to 180ft. work had to be stopped because of inadequate pumping appliances. In 1895 this mine was again worked, when it was stated that ore was being taken from a lode 8ft. wide, striking nearly N. and S. The lode is a true fissure vein, and has been proved auriferous for a length of 700ft. (1899.)

A large quantity of tailings and slimes resulting from the crushings were afterwards treated by Messrs. McArthur & Co., and 12,015 tons cyanided returned 2,747ozs. 6dwts. 3grs. of fine gold. This mine was occasionally worked by tributers and local syndicates, with payable results; and 794 tons 18cwts. treated at the Government Battery and Cyanide Works at Mount Torrens returned 455ozs. 6dwts. 13grs. of gold, valued at £1,756 6s. 2d.; the average yield being worth 44s. per ton.

New Era South.—Situated between the New Era and Two-in-the-Bush Mines. Worked in 1895.

New Venture is on section 5260. Some work was done in driving tunnels, but no gold was found.

Parliamentary Claim.—Locality, sections 5050 and 5051. A number of shallow openings have been made. Near the reef there was a run of surface gold 10yds. wide, going $\frac{1}{2}$ gr. to the dish.

Ridge is situated on section 5249, hundred of Onkaparinga, S. of the Bird-in-Hand Mine. There are three lodes bearing 10° E. of N., with an underlie of 40° E., varying in width from 1ft. to 16ft. The country rock consists of decomposed schist and sandstone, and the veinstone associated with the metallic mineral is quartz. Five shafts have been sunk; the deepest being 140ft. The main shaft was sunk to a depth of 120ft. vertical, but had to be abandoned in consequence of quicksand being met with. Water-level, 45ft. Drives and levels have been made to a total length of about 1,700ft. Two thousand five hundred tons of stone has been raised, yielding 380ozs. of smelted gold, valued at over £1,213. The crushings, however, at this mine were trial crushings and intermittent. The gold occurs in shoots. (1887.) Mr. Scarfe, the secretary, stated that this property had the Bird-in-Hand, Brind, and Eureka reefs, and the widths varied from 1ft. to 16ft. The deepest shaft was 210ft., and 1,700ft. represented the total extent of drives. Pyrites exist at lowest level, and 375ozs. of smelted gold was obtained from 2,116 tons of crushed quartz. (1899).

In May, 1895, a parcel of $39\frac{1}{2}$ tons of tailings were sent to the Mount Torrens Cyanide Works for treatment; these assayed from 2dwts. 22grs. of gold per ton to 6dwts. per ton. A small lot of 2 tons of blanketings included in this parcel assayed 13dwts. 6grs. The $39\frac{1}{2}$ tons returned 6ozs. 2dwts. 16grs. of gold, valued at £24 10s. 8d., the average extraction being worth 12s. per ton.

At a later date Messrs. McArthur & Co. treated at their cyanide plant at the Bird-in-Hand Mine 6,126 tons of the Ridge tailings for a yield of 1,000ozs. 16dwts. 2grs. of fine gold.

Two-in-the-Bush is on section 5261, hundred of Onkaparinga. There is one lode, bearing 10° E. of N., with an underlie of 40° E. The width varies from $1\frac{1}{2}$ ft. to 18ft. The country rock consists of decomposed schist and sandstone, and quartz is the veinstone associated with the metallic minerals. Three shafts were sunk, the deepest of which was 265ft. vertical. Drives and levels measuring about 1,000ft. in all had been made. Water-level 100ft. From 2,198 tons of stone 386ozs. of smelted gold, valued at £1,130, had been obtained. The crushings on this mine had been trial ones and intermittent. The principal work done was the sinking of the main shaft, and an endeavor to open up the ground at the deepest possible point that could be drained by the pumps. Mr. Scarfe, the secretary, reported that the drainage of the mine, being affected by the pumping operations at the Bird-in-Hand Mine, further work was deferred pending the successful development of that enterprise. (1899.)

The tailings which were left at this mine after crushing operations ceased were, in 1897, treated by the cyanide process by McArthur & Co., and 854 tons cyanided returned 68ozs. 4dwts. 4grs. of fine gold.

Woodside Gold Mining Company.—A syndicate in 1895 acquired the Bird-in-Hand and Ridge Mines and land on which the New Era South was being started. Costeaning was commenced on the latter to pick up the New Era reef.

Woodside Consolidation Syndicate.—In 1897 an English syndicate acquired an option over 2,694 acres of auriferous country round Woodside, some of the mines being the Bird-in-Hand, New Era, Bird-in-Hand Extended, Ridge, Nest-Egg, Fountain Head, Two-in-the-Bush, Eureka, Mint, and New Venture.

WORTURPA.—In July, 1899, a find of gold associated with telluride ore was made in the Illinawortina Pound by Messrs. B. and H. Stubbs on a low range, about $\frac{1}{2}$ miles S. of Worturpa Spring. Good specimens, showing coarse gold, were found;

and it was at first thought that gold was also in chemical combination with the tellurium as telluride of gold, but later assays went to prove that the gold was in a free state, and that the mineral associated with it was *melonite*, telluride of nickel.

Considerable excitement arose over this find; several companies were formed, and a large amount of work done, but the gold contents became poor in depth, although the lode body continued strong and well defined. Work therefore ceased, and the companies were wound up.

YUDNAMUTANA.—Near the Yudnamutana Mine the gravel and detritus has been worked to a slight extent for gold. Gold is also found here and there in the creeks and watercourses; but the work done simply consists of some very shallow holes and surfacing. But the last-named operation is difficult, owing to the creek beds and flats being filled with boulders. Prospecting might be carried on with advantage lower down the creeks, where they become less steep.

This discovery is believed to have been made by a Government prospecting party about the year 1874.

Vide also page 157.



IRON.

LIST OF THE CHIEF LOCALITIES IN SOUTH AUSTRALIA AT OR NEAR WHICH IRON ORES OCCUR.

Angaston, Barossa, Beltana, Burra, Blumberg, Clinton, Cutana, Crystal Brook, Eurelia, Gladstone, Gum Creek, Huddleston, Hawker (E. of), Hawker (hundred of), Iron Knob and Iron Monarch, Koolka, Kapunda, Kersbrook, Mount Jagged, Normanville, Oodla Wirra, Peralilla, Pernatty Lagoon, Pine Point, Point Lowly, Port Lincoln, Pandurra, Para Wirra, Quorn (Donnelly's quarries), Talunga.

CUTANA.—Locality, 10 miles S. of Mingary Railway Station; on level and gently undulating country. The ore consists chiefly of limonite, but hematite is also present. The ore beds vary in thickness from 10ft. to 20ft., and have a general inclination to the N.W. at low angles. The surface in the vicinity is heavily strewn with pebbles and boulders of iron ore. The beds are generally covered with limestone marl and loam to depths varying from 2ft. to 11ft. There is a large quantity of iron ore at this locality. Taking the ore bed to average 15ft. in thickness, an acre would contain about 60,000 tons. The largest continuous area proved is about 30 acres. Trial holes are necessary to ascertain the extent of these ore beds. Assays of the ore gave the following returns:—

Nodules from Surface.		Average Sample.	
Water	1.16 %	Water	5.08 %
Silica.....	6.26 %	Silica	18.47 %
Ferrous oxide..	0.79 %	Ferric oxide	71.04 %
Ferric oxide ...	88.40 %	= 49.73 % iron	
Alumina.....	2.65 %	Alumina...	4.37 %
Phosphoric acid	0.11 %	Phosphoric } acid..... }	0.06 %
Sulphur.....	Nil	Sulphur...	0.15 %
Titanic acid ...	Trace	Titanic acid	Trace

These quarries supplied iron ore as flux to the Broken Hill Proprietary Company at the time that smelting was carried on at Broken Hill. This is an important and extensive deposit, but is 203 miles distant from Port Pirie, the nearest seaport.

IRON KNOB.—Locality, 41 miles W.S.W. from Port Augusta. The Iron Knob is at present being worked for flux by the Broken Hill Proprietary Company. The outcrop of iron ore extends for a distance of 20 chains. A quarry has been opened at each end; from the N. quarry 10,000 tons of ore have been raised and shipped, and from the S. quarry 80,000 tons. At the S. quarry the workings are about 100ft. high at the face, with a width of 150ft. at the bottom. The ore is chiefly hematite. I estimate the quantity in sight above the level of the S. quarry at 1,000,000 tons. Average analyses of the ore show that it contains 68.5 per cent. iron, 2.3 per cent. silica, and no phosphorus nor sulphur. A railway line, 33½ miles long, from Iron Knob to Hummocky Hill jetty, has been built by the Broken Hill Proprietary Company; the ore is conveyed by this from the quarries to the coast, and thence by barges and steamtug to Port Pirie, a distance of 30 miles.

IRON MONARCH.—The deposit forms a capping on a hill which rises to a height of from 600ft. to 700ft. above the surrounding plain country. It covers an area approximately of 50 acres, and has an estimated thickness of from 100ft. to 150ft.; this thickness is probably exceeded in places. On the surface the ore contains manganese, which, however, may not be continuous in depth. Taking the bed to average 100ft. in thickness, I estimate that it contains about 20,000,000 tons of ore. In addition large quantities of iron ore, denuded from the bed, are scattered over the adjacent country. Analyses of the ore showed that it contained iron 54.57

per cent., manganese, 12.47 per cent., and silica 1.2 per cent., and iron 52 per cent., manganese 15 per cent., silica, &c., 2.3 per cent. A complete analysis gave the following results :—

Water	1.23 %
Silica	1.19 %
Ferrous oxide	1.36 %
Ferric oxide	92.88 % = 66.08 % iron
Alumina	2.47 %
Phosphoric acid	0.04 %
Sulphur	Nil
Titanic acid	Nil

At the Iron Knob and Iron Monarch, which may be considered as one deposit, there is exposed a vast quantity of high-grade iron ore and manganic iron in sight, which I estimate at 21,000,000 tons and its magnitude and importance are, so far, not equalled in Australasia. Abundance of limestone flux for smelting purposes is obtainable along the shores of Spencer's Gulf.

MOUNT JAGGED.—Locality, 13 miles N. from Port Victor. The ore occurs in connection with a quartz reef, and appears to be a lode formation. A quarry, 60ft. by 25ft. by 25ft. deep, has been opened here, exposing hematite iron ore 12ft. in thickness. There are other small excavations in the neighborhood exposing ore. In 1873 smelting works were erected to work this deposit, and pig iron was produced by means of locally made charcoal. The cost of producing this cast iron was about £2 10s. per ton. Owing to the lack of capital, work was discontinued. In the vicinity there are large deposits of crystalline limestone suitable for flux, and water and firewood are abundant. The deposit is limited in size, and the probability is that the iron will give place to quartz in depth, and develop pyrites below the water-level. A sample of the ore gave the following analysis :—

Water	Trace
Silica	0.80 %
Ferrous oxide	6.10 %
Ferric oxide	87.98 % containing 66.34 % iron
Phosphoric acid	0.01 %
Titanic acid	5.38 %
Sulphur	0.09 %

PERALILLA.—Locality, 7 miles N. of Port Victor. The deposit caps the summit of a high hill, and has been quarried out over an area of about $\frac{1}{2}$ an acre, to an average depth of 8ft. An area of about 4 acres of the deposit remains, having an approximate thickness of 12ft. The ore consists of limonite and clay ironstone, and is interstratified with ferruginous sandstone. It is roughly estimated that 100,000 tons of ore remain. A sample of the ore gave the following analysis :—

Combined water	12.03 %
Silica	12.00 %
Ferric oxide	64.57 % containing 45.90 % iron
Phosphoric acid	0.51 %
Alumina	10.00 %
Sulphur	0.14 %

OODLA WIRRA.—Locality, 4 miles from Oodla Wirra Railway Station. It is reported that 16,000 tons of ore have been obtained for the Broken Hill Proprietary Company as flux from this place. There are several quarries from which this ore has been raised. Apparently most of the suitable ore has been removed, and the Broken Hill Proprietary Company now obtain their supply from the Iron Knob.

DONNELLY'S.—Locality, block F, hundred of Yarrah, 14 miles from Quorn Railway Station, which is 25 miles from Port Augusta. There are five chief outcrops,

from which iron ore for flux has been raised and shipped to the Broken Hill Proprietary Company at Port Pirie. The ore consists of limonite, and several smaller outcrops of limonite and manganese ore occur. The quantity shipped as flux to Port Pirie is given as 17,500 tons, and my rough estimate of the quantity of ore likely to be available is 470,000 tons. This is a valuable and fairly extensive deposit, which can be quarried cheaply, and is only 39 miles from Port Augusta. It should not be lost sight of as a possible source of supply. Six samples of the ore on analysis yielded as under :—

	Ferruginous Manganese Ore.	Siliceous Hema- tite.	Limonite.	Limonite.	Siliceous Hema- tite.	Siliceous Limonite.
Water	—	4.61	9.06	11.22	5.04	8.54
Insoluble silica and sili- cate of alumina	1.69	12.79	1.39	.67	26.10	20.29
*Ferric oxide	32.96	74.95	79.75	83.84	63.68	62.71
Ferrous oxide	—	2.52	1.94	trace	trace	2.23
Alumina	8.43	3.99	6.30	.89	4.08	4.74
Phosphoric acid	1.22	.93	1.34	2.35	1.16	1.00
Sulphur	.11	.06	.18	.05	nil	nil
Titanic acid	nil	nil	nil	nil	nil	nil
†Manganese dioxide...	54.57	—	—	—	—	—
Copper	—	—	—	—	.16	—
	98.98	99.85	99.96	99.02	100.02	99.51
*Containing iron	23.07	54.43	57.34	58.68	44.57	45.63
†Containing manganese	34.50	—	—	—	—	—

With regard to the other localities mentioned in the list, iron ore deposits, varying in size and quality, are known to occur at them. Suitable fluxing material has been supplied to the Dry Creek, Block 14, Wallaroo, and Broken Hill Proprietary Company's smelting works from Angaston, Barossa, Blumberg, Clinton, Crystal Brook, Gladstone, Huddleston, Kapunda, Kersbrook, Normanville, Port Lincoln, and Para Wirra. From Burra and Gum Creeks flux was obtained for the Burra Mine smelters; and the other localities, though containing, in some cases, large supplies, are remote and unworked at present. (Government Geologist, February, 1903.)

PINE POINT.—Lease 1935. See page 120.

A shipment of 2,000 tons of iron ore from the Iron Knob and Iron Monarch was forwarded to England by Messrs. Elder, Smith, & Co. in 1907. All reports received by the company concerning the parcel were good. It was found to contain 97 per cent. iron oxides, carrying 68 per cent. metallic iron, and was disposed of in Scotland at a satisfactory price; but, as a general thing, oversea freights are too high to admit of continuous business.

MINERAL PHOSPHATES.

HUNDRED OF CLINTON; YORKE PENINSULA.—No. 1 *Phosphate Discovery* was made by Mr. Barton, and consists of a series of discoveries on sections 348, 349, 350, 351, 356, and 357, hundred of Clinton. They extend from $2\frac{1}{4}$ miles to $3\frac{1}{4}$ miles N. from Port Clinton, on Gulf St. Vincent, which is the nearest shipping place.

The phosphate rock has been opened up and quarried to a small extent at four places, which are known as Nos. 1, 2, and 3 quarries and Baker's Gully, and exposed by cuttings and shallow excavations at numerous other places for a distance, from N.E. to S.W., of $1\frac{1}{4}$ miles.

The existence of phosphate beneath the soil is indicated by scattered fragments and blocks which have been upturned and brought to the surface by the plough at the time the land was under cultivation. Some of these fragments are white in color, whilst others are brown, yellow, and iron-stained; they are often associated with iron ore and manganese, fragments of which are also scattered on the surface; they are embedded with black earth, clay, loam, marl, &c., and occur in patches. The soil generally contains nodules and lumps of phosphate rock, beneath which lies the phosphate deposit *in situ*. This consists of soft yellow and grey clay, calcareous marl, and sandy clay, embedded in which are segregated, rounded, and bedded-like masses of phosphate rock.

The rock presents considerable variety in appearance, being sometimes grey, white, and chalk-like, reticulated with thin veins of denser composition, and at others a compact yellow grey and reddish-colored rock, with cellular spaces of various sizes, causing the whole to have a brecciated appearance, and again compact and nodular. In places earthy manganese fills the cellular spaces, particularly in the case of the soft chalk-like rock, which is also stained with iron oxide.

The deposit as a whole has no regular stratification, although here and there appear traces of stratification, which, however, are not persistent. The strata in which the deposits occur are Cambrian limestones. Walls of this primary limestone are to be seen in some of the excavations. These are in some places vertical and in others inclined, but dip generally at a much higher angle than the dip of the limestone strata. From this and other facts relating to the exposed portion of the limestone rock, I am of opinion that at one time caves and fissures, varying in extent, were formed in the limestone rock, and that at a later period these became filled with the phosphate deposit. With regard to the size of these caves and depressions, the evidence obtainable from the position of the outcrops of limestone points to them being large. At Baker's Gully, section 357, the surface soil has been removed for a distance from E. to W. of 4 or 5 chains, exposing the phosphate deposit beneath. The width between the limestone rock outcrops is about 20 chains. At quarry No. 3, section 348, a vertical limestone wall is visible on the E. side, and the deposit is not defined W. At No. 1 quarry an inclined limestone wall is visible on the W. side. Sufficient work has not yet been done to allow the surface area of the deposits to be ascertained; this can only be determined by a careful survey and the sinking of trial holes.

The depth to which the deposits may extend is unknown; the present shallow quarries are not deep enough to yield evidence on this point. Judging by the apparent width of the cavities containing the deposits it is reasonable to suppose that in some places the depth will be considerable. The question is one that will have to be determined by actual experiment.

No fossils have been found so far in the deposits, and their origin can only be conjectured at present. My investigations lead me to believe that the quantity of rock containing a sufficient percentage of phosphate of lime to render it of commercial value is very large, and the configuration of the country is most favorable to the opening of quarries whereby the rock can be raised cheaply and expeditiously, and

shipments averaging 70 per cent. of tricalcic phosphate and less than 6 per cent. of iron and alumina could be easily selected. As a matter of course the grading and selection of the rock must be guided by systematic and frequent analyses made on the spot.

With regard to the analyses made by Mr. Goyder, Government Analyst (a list of which is appended), it is to be noted that several of the more argillaceous samples were found to contain hydrous phosphate of alumina instead of phosphate of lime. This substance, Mr. Goyder states, would probably be as valuable after fine grinding as phosphate of lime, but is not suitable for the manufacture of superphosphate.

On section 405 (see list of analyses), 5 miles N. of the main discovery, rock phosphate of lime can be picked up on the surface. This indicates the existence of a deposit here; but so far no work has been done.

It is most probable that deposits of phosphate rock occur in other portions of this district when occupied by the Cambrian limestone.

This discovery is important, not only to South Australia, but to the Commonwealth generally, inasmuch as up to the present no similar deposit so likely to prove of such great commercial value has been found on this continent.

LIST OF ANALYSES.

	Phosphoric Acid.	Equivalent of Tricalcic Phosphate.	Insoluble Matter.	Oxide of Iron and Alumina.	Loss on Ignition.	
	%		%			
1	32.94	71.90	7.59	6.26	3	Rock phosphate, soft ferruginous. Farthest N. quarry; average across, 10ft.
2	32.68	71.24	11.15	3.1	2	" compact, whitish. Baker's Gully
3	32.76	71.52	11.02	2.9	2	" soft. Bottom of No. 1 quarry
4	34.56	75.44	8.28	3.10	4	" compact, whitish
5	28.16	61.47	21.16	5.18	3	" siliceous rock phosphate. No. 3 quarry
6	31.84	69.50	12.34	3.1	2	" compact, whitish. Baker's Gully
7	31.41	68.67	11.08	2.9	2	" soft. Baker's Gully
8	15.43	33.68	52.0	—	1	" surface stone. Section 405
9	14.43	31.50	59.4	—	2	" nodular
10	1.68	3.62	94.7	—	1	Ferruginous clay stone, nodular
11	17.0	—	38.77	19.06	18	Soft yellow with dense streaks; hydrous phosphate of alumina and ferruginous clay stone
12	18.94	—	21.9	—	31	Soft white with reticulated dense veins; hydrous phosphate of alumina and clay stone. Farthest S. trench
13	6.91	—	74.5	—	5	Clay stone and hydrous phosphate of alumina. Farthest N. quarry, lowest depth
14	12.92	—	51.5	—	6	Ferruginous clay stone and hydrous phosphate of alumina. Baker's Gully
15	12.13	—	44.0	—	11	Ferruginous clay stone and hydrous phosphate of alumina. Barton's flux quarry
16	22.88	—	29.35	—	21	Hydrous phosphate of alumina and clay stone, cellular rock. Baker's Gully and S.
17	19.81	—	25.15	24.04	20	Hydrous phosphate of alumina. Baker's Gully
18	8.62	18.0	59.0	—	7	Ferruginous clay stone and hydrous phosphate of alumina.

NOTE.—The insoluble matter consists of silica and clay. Samples 1 to 9 contain fluorine in not more than the usual percentage; the remainder only contain a minute trace.

Government Geologist, 3-2-02.)

FAIRVIEW, HUNDRED OF BRIGHT.—The localities where these discoveries have been made are on section 4, hundred of Bright, 18 miles S.S.E. of the township of Kooringa. The discovery was made by Mr. F. A. S. Field, who has been granted a reward area

of 1 square mile by the Government for mining purposes. The phosphate rock has been found also on the surface, and in trenching at several other places on the 40-acre blocks which have been applied for as leases. Operations are confined at present to two places, which are known as the N. and S. workings. At the N. workings two shafts, each some 20ft. in depth, with drives and open excavations, have proved the deposit to extend over an area of about 100ft. square. The phosphate is in irregular-shaped bodies and bands, associated with claystone and clay, with which it is interstratified and segregated. It contains small veins of quartz, such as are found in lode formations in some places, and varies from a compact chalk-like rock to a soft friable one. On the E. side dolomitic limestone, of presumably Cambrian age, bounds the deposit; and W. at a distance of several chains, in which direction the ground rises steeply, the bedrock exposed is quartzite. These rocks strike N.N.W. and dip W.; the surface space between the outcrops is covered with soil and detritus. At the S. workings a quarry has been opened up along and into the side of the hill for a length of 130ft., and a width varying from 30ft. to 70ft.

The workings now in progress are in massive phosphate rock, which is being quarried out in large blocks from a face 66ft. long and from 6ft. to 12ft. high. It shows underfoot, and the depth to which it extends has not yet been ascertained. Immediately E. the deposit is bounded by the dolomitic limestone, and W. at a distance of several chains quartzite outcrops on and along the hill: these are a continuation S. of the rock exposures mentioned in connection with the N. workings. Outcrops of phosphate rock occur at several points W. of and between the N. and S. workings, a distance of $11\frac{1}{2}$ chains, and it is most probable that the deposit is continuous for this distance. Phosphate has also been found N. and S. of the main workings, but hitherto not in large quantities. Sufficient prospecting has not yet been done to show to what extent it exists at these places. S. of the S. workings the dolomitic limestone and quartzite appear in occasional outcrops, which increase in volume in that direction, particularly in the case of the limestone, which occupies a large area. The same thing occurs N. of the N. workings.

No estimate of the quantity of phosphate rock available can be formed until more development work has been done by extending the workings W., and, between the N. and S. quarries, sinking trial holes or bores, and trenching through the overburden. Judging from the surface indications it appears most probable that the main deposit occupies a considerable portion of the space between the outcrops of dolomite and quartzite, and extends N. and S. for a greater distance than that between the workings, viz., $11\frac{1}{2}$ chains.

The evidence so far as disclosed by the quarrying at present being done, and the surrounding surface indications, is in favor of the existence of a large quantity of marketable phosphate rock. After operations have been carried on for a few months longer a proper estimate of the quantity likely to be available can be made. The deposit is very similar to that of Clinton, and is associated with Primary rocks of the same geological age. In this case, as at Clinton, I believe the deposit fills large cavernous openings or caves in the dolomitic limestone. These openings may have been ravines at the outlet of an ancient creek or river, in which silt might be deposited and form an estuary. The deposit at Clinton is close to the seacoast; and that at Bright, although now at a distance from the sea, was, in the late Tertiary times, in close proximity to it.

The theories put forth to account for the origin of rock phosphate may be applied in a measure to these deposits. First, they are, or have been at one time, on the seacoast, and therefore may have originated in the deposition of guano by bird life. Second, the dolomite limestone from Bright contains a small percentage of phosphate of lime, the analysis showing from a trace to 1.30 per cent., and that from Clinton 0.74 per cent. to 2.10 per cent., and phosphate may have been leached from this rock. Third, the clay and silt beds on which the phosphate occurs may have contained originally animals secreting phosphate of lime. Fourth, as quartz veins are associated with the deposit at Bright, another theory suggests itself, viz., the

deposition of phosphate by hydrothermal action, as in lode formations. Analyses of samples taken from the workings have been made at the School of Mines, with the following results:—

Description of Sample.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	Oxide of Iron and Alumina.
	Per cent.	Per cent.	Per cent.
ANALYSES OF PHOSPHATE ROCK.			
Dense rock	27.23	59.44	1.00
Soft friable rock	27.95	61.02	2.00
Brecciated rock	34.92	76.23	3.4
Dense rock	31.66	69.12	1.07
Friable rock	23.37	51.02	5.9
Rock containing phosphate of iron, clay, and quartz	8.7	18.99	—
ANALYSES OF CONTAINING ROCKS, ETC.			
Dolomitic limestone	0.6	1.30	—
“ “	trace	—	—
“ “	“	—	—
“ “	“	—	—
Clay stone	0.5	1.09	—
“ “	0.7	1.52	—
Black chert	1.74	3.8	—

(Government Geologist, 27-7-03.)

HUNDRED OF BELVIDERE.—The locality is on section No. 1551, hundred of Belviders, 4 miles S.E. of Kapunda. Some 20 years ago a shaft was sunk on this section to prospect for copper, the green stains due to phosphate of iron having been mistaken for traces of that metal. Mr. Hooper, of Kapunda, afterwards sent a piece of this rock to Wallaroo to be tested for copper. It was found to contain phosphate.

About three years ago specimens were taken by Mr. A. Duncan, of Kapunda, from another part of the same section; these, he found, contained traces of phosphate. Three months ago Messrs. Green and Duncan had other samples of rock tested, which proved to be rich in phosphate of lime. This led to the taking up of the section by them under arrangement with the owner, Mr. Hansberry.

The principal outcrop of phosphate rock is approximately 10 chains long by 2½ chains wide, and it is in the vicinity of this exposure that the shafts and quarry workings made in prospecting for and opening up the deposit are situated. The outcrop can be traced S.E. for some 30 chains, and, where not actually outcropping, scattered lumps of phosphate rock strewn over the surface and embedded in the soil indicate its presence beneath.

The outcrops to the S.E., which are in the vicinity of a quartzite and slate hill, contain quartz and ferruginous matter, and samples, on analysis, were found to contain hydrous phosphate of alumina instead of phosphate of lime. This mineral is also associated with the phosphate rock at Clinton.

The deposit occurs in limestone, quartzite, and slate formations of the same geological age as those of Clinton and Bright. The limestone bounds it at a distance on the E., N.E., and N. sides at a low elevation, while the quartzite and slate occur as isolated hills of small extent on higher ground. The ground between the outcrops is more or less thickly covered with an overburden of soil and detritus.

The workings consist of quarries and shafts. The main quarry, near the E. side of the N.E. outcrop, is 90ft. into the hill and 35ft. wide in one place. The face of rock, which is getting thicker as work advances, is from 10ft. to 15ft. high. A shaft has been sunk 22ft. in the deposit here. Another quarry has been opened near the end of the same outcrop in conjunction with a shaft 23ft. deep. Various other shafts up to 10ft. and 15ft. deep have been sunk in the vicinity, and in most phosphate of good quality has been disclosed.

Rock in massive pieces and rich in phosphate is being raised from the main quarry. Rough average samples taken by me from two heaps of rock raised from this quarry and the other workings, on analysis, returned 60 per cent. and 77.9 per cent. of tricalcic phosphate respectively. The proprietors estimate the marketable rock raised at 300 tons. Trial shafts and trenches will have to be sunk before any estimate of the actual quantity of rock phosphate in this deposit can be made. Judging from the surface appearance, I am inclined to believe that phosphate exists over a considerable portion of the wide spaces between the outcrops of the limestone and quartzite, beneath the overburden. As to the depth of the deposit, I am of opinion that it will be variable and irregular, but at the same time considerable, in places. The area proved at and in the vicinity of the N.W. outcrop may, I think, be safely estimated at 5 acres or over.

This is the third valuable discovery of phosphate that has been made in South Australia. It is easily accessible, being only 4 miles from Kapunda Railway Station. The probability is that other similar discoveries will be made over the Cambrian limestone areas in this and other parts where that formation is exposed.

Analyses of samples taken by me have been made at the School of Mines, with the following results:—

ANALYSES OF PHOSPHATE ROCK.

Description of Sample.	Percentage of Phosphoric Acid	Equivalent Percentage of Tricalcic Phosphate.	Percentage of Oxide of Alumina and Iron.
Soft, granulated, with hard lumps	27.0	58.9	5.4
Dense, chalklike	31.4	68.5	2.3
Dense, granular	31.6	69.0	2.9
Cellular	35.7	77.9	3.0
Dense, bluish, chalklike	28.5	62.2	1.1
Granular and solid	37.1	81.0	1.0
Dense, brown-colored	35.0	76.4	1.9
Cellular, with bluish bands	35.3	77.0	2.2
Dense, chalklike	35.4	77.3	1.1

PERCENTAGES OF PHOSPHORIC ACID IN SUBSTANCES FOUND ASSOCIATED WITH THE PHOSPHATE ROCK.

	Phosphoric Acid.
Hydrous phosphate of alumina and quartz.....	22.0 per cent.
Ferruginous quartz	9.9 "
Hydrous phosphate of alumina and quartz.....	18.5 "
Clay stone and quartz	7.5 "
Hydrous phosphate of alumina and quartz.....	17.9 "
Sandstone	2.7 "
Hydrous phosphate of alumina and iron with quartz.....	16.0 "

(Government Geologist, 2-9-03.)

RIVER MURRAY.—In the Tertiary formations through which the River Murray has cut its way deposits of phosphate of lime, consisting of fossil whalebones, sharks' teeth, &c., occur. The expectation is that at greater depths larger deposits of this valuable fertiliser may be found.

Extract from the Review of Mining Operations during the Year 1903.

During the year two fresh discoveries of workable deposits have been opened up, one in the hundred of Bright, 18 miles S.S.E. of Koorunga Railway Station, and the other in the hundred of Belvidere, 4 miles S.E. of Kapunda Railway Station. Other discoveries, the extent of which is not yet determined, have been made in the Ashbourne district, south of Adelaide, and near Ardrossan, on Yorke Peninsula.

For 1903, from the deposits worked by the Clinton Phosphate Company, near Clinton, Yorke Peninsula, the original find of phosphate in South Australia, 1,052 tons of phosphate rock, containing from 62 per cent. to 65 per cent. of tricalcic phosphate, have been sold.

From the Fairview Phosphate Mine, hundred of Bright, second discovery, 100 tons of rock, containing 55 per cent. tricalcic, have been sold. Here a large amount of opening up and road-making work has been done, and a company named the Adelaide Artificial Manures Company formed. North of and adjoining the Fairview Company's Reward lease another deposit has been found, and named the "Lily Dora." Ten tons from this place, averaging 62 per cent. of tricalcic, have been forwarded to the Chemical Works. A further discovery has been made to the N. again of this.

From the Kapunda find, hundred of Belvidere, third discovery, about 400 tons were sent away, carrying from 50 per cent. to 78 per cent. of tricalcic. The prospects here also are highly encouraging.

Extract from Review of Half-year ended June 30th, 1904.

THE CLINTON PHOSPHATE COMPANY, working the deposit at the Clinton quarries, has dispatched during the half-year 630 tons of phosphate rock, containing from 60 per cent. to 66 per cent. of tricalcic phosphate.

FAIRVIEW PHOSPHATE MINE, hundred of Bright.—Attention has been devoted entirely to developmental work, with the result that one deposit has been proved to extend 20 chains in length, the width varying from 200ft. to 400ft., and depth proved at one place to 75ft.

LILY DORA, adjoining the above.—No rock has been sent away. Work has been confined to opening up and prospecting the ground.

FOUR MILES NORTH OF THE FAIRVIEW a siliceous rock phosphate has been discovered, and 6 tons sent away for experimental treatment.

FOUR MILES SOUTH OF THE FAIRVIEW a further discovery has been made, from which 5 tons on treatment at the Adelaide Chemical Works returned 70 per cent. tricalcic phosphate.

KAPUNDA, ST. JOHN'S.—The original find is now known by this name; it has been steadily worked, and about 650 tons of 60 per cent. rock sent away.

A DISCOVERY has been made on sections 1436 and 1437, hundred of Belvidere, which is as yet undeveloped.

SECTIONS 88, 115, AND 113. HUNDRED OF BELVIDERE, near Koonunga.—A new discovery has been made. Messrs. Clutterbuck Bros. and Field have dispatched from this 100 tons of rock, averaging 52.47 per cent. tricalcic phosphate.

SECTION 87, HUNDRED BELVIDERE.—Another discovery has been made of a promising nature.

MOUNT MAGNIFICENT.—A deposit was discovered last year on sections 293 and 294, hundred Kuitpo, and some low-grade rock obtained. This find has since been further prospected, and, so far, a body of phosphate rock 3ft. in thickness disclosed by trenching. This varies in quality from 45 per cent. to 53 per cent.

HUNDRED OF CUNNINGHAM, Yorke Peninsula.—Extensive prospecting is in progress on section No. 30E. The deposit is large, and in some places analysis shows the rock to contain as much as 82 per cent. to 50 per cent. tricalcic phosphate. The property is now being developed by means of an open cut and tramway.

Extract from Review of Half-year ended December 31st, 1904.

Further new and promising finds have been made in the Carrieton and Kapunda districts, and the occurrence of phosphate rock at intervals has been demonstrated for 200 miles along the main range; but the industry is now confronted by a commercial difficulty which has checked the output. Briefly, the local article, which averages about 60 per cent. tricalcic phosphate, cannot yet compete with the rock imported from Christmas and Ocean Islands, which averages at least 80 per cent., and as farmers at present demand a 40 per cent. fertiliser it will be seen how essential high-grade rock is to the manufacturer. Here it may be mentioned, on the authority of Professor Angus, that the experience of English agriculturists has proved that 26 per cent. superphosphate is the most suitable for general use. It may be

confidently expected that by intelligent and careful selection of rock, guided by systematic analyses, the local article can be readily graded up to requirements, and it has been suggested to the Hon. Minister that experiments and tests should be taken in hand by the Professor of Agriculture.

HUNDRED BENDLEBY—Discoveries were made by Mr. P. W. Jones on sections Nos. 2 and 28, hundred of Bendleby, about 8 miles E. from Carrieton.

Section No. 28.—Phosphate rock has been found at three or four places on this section, where it outcrops in irregular-shaped veins and masses in claystone and clay. The country rock consists of dolomitic limestone, argillaceous limestone, and clayslates, striking N.N.E., and dipping W.N.W. at a high inclination. The phosphate rock, as usual, is found chiefly in conjunction with the limestone, and, so far as can be judged by present appearances, occupies places in the bedrock which were originally open cavities. The area between the outcrops of bedrock is covered with soil and detritus, so that to ascertain the extent of the deposits a considerable amount of trenching and costeaning will have to be done.

Section No. 2.—Phosphate rock occurs here under the same conditions as in section 28, the surface outcrops indicating its probable occurrence over an area of several acres. Here, also, the surface soil and detritus prevent any estimate of the area likely to be occupied by phosphate being made until the ground has been trenched across. The distance between the two localities is 2 miles, and is most probably occupied in places by phosphate rock, which may be sought for in the neighborhood of the limestone strata. So far as the limited prospecting operations have gone, phosphate rock of fair grade has been found at places where it comes to the surface, and is not overlaid by soil and surface deposits; it most probably exists elsewhere beneath these, but to what extent can only be ascertained by actual prospecting, work which may be undertaken with every prospect of success.

The dolomitic limestone in association with which these deposits occur is of the same age geologically as those rock formations in which phosphate rock has been found at Clinton, Kapunda, Bright, Mount Magnificent, &c.

The beds under notice extend S. through Walloway and Orreroo, where they attain considerable development. Phosphate rock has now been found to occur, at wide intervals, along the main range for a distance of 200 miles.

ANALYSES.

Section No. 28.

		Tricalcic Phosphate. Per cent.	Grade of Iron. Per cent.
Excavations at Napa Napa Hill ..	Siliceous rock phosphate	12.4	—
“ near creek ..	Rock phosphate	73.1	2.7

Section No. 2.

— ..	Dolomitic limestone and phosphate ..	17.9	—
— ..	Siliceous rock phosphate	59.1	3.7
— ..	“	58.1	—

(Government Geologist, 6-2-05.)

MOCULTA.—Locality, section 102, hundred of Moorooroo, about 3 miles N.E. from Angaston. The discovery was made by Messrs. Keüper and Green during the latter part of last year. The rock is exposed at intervals over a considerable portion of section 102, and also on section 105, adjoining. It occurs in connection with crystalline limestone of Cambrian age, which outcrops extensively in the neighborhood. A covering of black soil overlies the deposit to the depth of a foot or more, and until this has been trenched through its area and boundaries cannot be ascertained, but it will probably be found to extend over a considerable portion of the 11 acres held by Messrs. Keüper and Green. A cutting opened in the E. side of the hill, after passing through 75ft. of clay and earthy material, met the phosphate rock, on which it was continued for 73ft.; the thickness proved by this cutting is 18ft. on the W. end and about 25ft. in the middle, the phosphate being still underfoot. The rock occurs in boulders, masses, nodules, &c., imbedded in clay and

earthy matter, approximately amounting to 10 per cent. of the whole mass. A special feature is the frequent occurrence of radiated concentric crystalline phosphate in addition to the massive, cellular and chalk-like rock usually found.

Messrs. Keüper and Green state that 600 tons have been raised from this quarry, 400 of which have been disposed of at 5d. per unit on a percentage of tricalcic phosphate varying from 67 per cent.

KOONUNGA.—The chief locality is on section 87, hundred of Belvidere, and 4 miles to 5 miles from Kapunda. Other localities are on sections 88, 115, and 116. These deposits are all in the Cambrian limestone. The principal workings are on a part of section 87, known as Keüper's Freehold, and consist of an excavation 40ft. long and 26ft. deep. The rock occurs under similar conditions to that found in other parts of the district, viz., in conjunction with clay and earthy matter. The proprietor states that 600 tons have been raised from this quarry and sold on percentages varying from 51 per cent. to 65 per cent. tricalcic phosphate. The extent of the deposit here has not yet been fully ascertained, but from surface indications is probably considerable.

The workings on section 88 are shallow, and less extensive than those on section 87; 200 tons are stated to have been raised and sold from this place.

Analyses of samples, varying in structure and other characteristics, taken from the quarries at Moculta and Koonunga gave the following results:—

Rock Phosphate.	Iron and Alumina.	Phosphoric Acid.	Equivalent of Tricalcic Phosphate.
	%	%	%
Crystalline concentric	1.1	37.0	80.8
Cellular	0.9	37.4	81.6
Cellular and massive	—	36.4	79.5
Chalk-like	5.6	32.8	71.6
Laminated	5.0	33.9	74.0
Average of block from Moculta (100lbs. weight)	2.3	34.2	74.6

The phosphate deposits already found in this district are worthy of more attention in the way of prospecting and development than they have yet received; notably so the St. John's, near Kapunda, and Keüper and Green's, near Angaston, which both give promise of yielding large quantities of high-grade rock when systematically opened out.

The industry is only in its infancy, and has not yet engaged the notice of capitalists. When the importance of these discoveries is recognised capital will doubtless be attracted and scientific and economic modes of working adopted, leading eventually to the manufacture on a large scale of fertiliser from South Australian phosphate. (Government Geologist, 9-3-05.)

Discoveries have been made and are being worked near Hackham, hundred of Noarlunga, and on section 65 and adjoining sections, hundred of Willunga.

During the year ended June 30th, 1907, 6,700 tons of South Australian rock phosphate were marketed, the average crude value being about £1 per ton.

NITRATES AT ELDER'S ROCK.

The Inspector of Mines reports that Elder's Rock, about 12 miles E. of Paratoo Head Station, is a remarkable one, there being no other similar formation in the surrounding locality. It rises abruptly to the height of about 50ft., and extends N. and S. for 120ft., the greatest width being 90ft.; it covers an area of about 770 square yards, the cubical contents being about 9,000yds. The outside shell of

the rock is quartzite, which on being penetrated gives place to soft material of various colors—from light yellow to purple—having very much the appearance of decomposed slate and sandstone. In almost all instances where tests were applied the fumes of ammonia were very pronounced; it could also be detected from the summit of the rock in places where it had been exposed and portions became detached owing to atmospheric influences. At the S. end of the rock there is an ironstone outcrop, which appears to limit the nitrate material in that direction; but until further explorations have taken place little can be said in regard to its real value or extent. Nine samples were taken, and gave results clearly showing that the value of the material will fully warrant the property being further explored. Calculating on the following approximate current values, the approximate commercial value of the samples is—Ammoniacal nitrogen, 12s. 4d. per unit; nitric nitrogen, 15s. 6d. per unit; organic nitrogen, 10s. per unit; phosphoric, insoluble, 1s. per unit; phosphoric citrate, soluble, 4s. 9d. per unit; potash, water soluble, 4s. per unit. (I.M.R., 6-1-06.)

A small company spent about £500 prospecting here, but no results of commercial value were obtained.

OCCURRENCE OF NITROGENOUS GUANO AT ORATAN ROCK.

This rock is situated about 10 miles S.E. of Netley Station, and is composed of a mass of quartzite and quartzose sandstone, forming a capping about 200ft. thick, on sandstone grit, conglomerate, and soft slate.

On the E. side of the quartzite there is a cave, which, for the purpose of describing, may be divided into two portions, viz., the outer and inner portions. The outer portion is 30ft. long, 12ft. wide, and 10ft. high; and the inner portion 9ft. in diameter at its entrance, and it extends W. about 20ft., where it becomes a mere fissure in the rock. The floor of the outer cave is covered with a dry, dusty deposit mixed with pieces of rock and fragments of bones of small animals and other detritus. A sample of this on being analysed was found to contain 84.95 per cent. of sand, 2.57 per cent. phosphoric acid, 0.60 per cent. nitrogen. The inner cave is practically filled with a deposit of a greyish-yellow color, which is the nitrogenous guano; it extends back into the fissure before mentioned, and is covered with loose sandy material. A sample of the latter was found to contain 83.45 per cent. sand, 0.55 per cent. phosphoric acid, and 1.68 per cent. nitrogen. A sample of nitrogenous guano on analysis proved to contain 23.44 per cent. nitrogen, equivalent to 28.49 per cent. of ammonia and 7.1 per cent. potash; it is, therefore, a valuable substance.

Owing to the irregular shape of the cave, the narrowness of the fissure, and the absence of evidence as to what portions of the fissure are occupied by this deposit, I am unable to estimate the quantity; it cannot, however, be large, as the extent of the deposit as a whole is limited by the size and irregularities of the cave; and, this being in sandstone and quartzite, is not likely to be connected with a system of caves, as it might be if in limestone.

To what animals the deposit is due it is impossible to say, as the cave has been occupied at times by animals of various kinds, including bats, owls, wallabies, &c.

The presence of such a large percentage of ammonia is due, doubtless, to the guano being protected from rain for a long period, during which time the cave was used as a camping place for the animals. Other caves of smaller size have been found in similar quartzite and sandstone beds capping the hills and ranges in the district, some of which may be found to contain similar deposits in small quantities; as, owing to the small size and irregular shape of caves in this kind of rock, it is not likely that any extensive deposits will be found. (Government Geologist, 7-4-02.)

BONE BRECCIA AND ROCK PHOSPHATE AT BROTHERS ISLANDS.

These islands are situated in Coffin's Bay, about $\frac{1}{2}$ mile W. from the S.W. extremity of Horse Peninsula. They consist of two small islands, the larger and most W. one being about 7 chains long and 4 chains across, and rising at the highest point to about 40ft. above high-water mark; the smaller one is about 2 chains in length, about 1 chain in width, and rises about 15ft. above high-water mark.

The lowest visible rock is a yellow granular limestone, and the surface rock consists of marine limestone, in which numerous holes, cavities, and crevices occur. On the W. end of the larger island a small deposit of fossil bones and bone breccia is showing; this place has every appearance of having been at one time a cave, but, the end of the island having been eroded by the action of the sea, only the back part of the cave has been left. Although somewhat fragmentary, the fossil bones are in a good state of preservation: skulls, lower jawbones with teeth, and other bones of the giant kangaroo have been obtained, also bones of small animals and birds. Some of the bones have been broken into fragments and subsequently consolidated by calcareous matter into breccia, while the limestone rock in the immediate vicinity of the bones and breccia is more or less phosphatic.

On the N. side of the island, close to the water, and where the rocks have been washed bare, several small crevices in the limestone rock are visible; they extend towards the centre of the island and are filled or partly filled with rock phosphate, while in one place a horizontal crevice occurs and appears to be an entrance to a cave. It is too narrow to permit of ingress for more than 4ft., but on the lower side phosphate rock in layers is visible for about 2ft. in thickness.

A considerable quantity of guano mixed with sand, broken up seashells, and a little vegetable matter has been removed from the larger island for use as manure, and in collecting this the holes and cavities in the limestone rock have been followed down and this material obtained to a depth of 6ft. or 7ft. Bone breccia has been met with at a depth of 10ft., but no exploration has been made below this, and, therefore, there is no information as to what depth the phosphate, breccia, &c., may extend. The limestone rock is favorable to the occurrence of caves, and it is quite possible that cavities of some extent containing similar deposits may be found.

Samples of bone breccia from W. end of the island gave 54.6 per cent. and 59.1 per cent. tricalcic phosphate.

Samples of rock phosphate from N. side of the island gave 55.9 per cent. and 68.3 per cent. tricalcic phosphate.

Samples of the limestone rock gave 2.2 per cent. and 4.3 per cent. tricalcic phosphate. (D. R. (George), 23-4-02.)

BROWN COAL, LIGNITE, ETC.

From time to time announcements have been made of supposed discoveries of coal, which in most instances have proved to be, at best, merely Tertiary lignites, of no value for fuel. In two cases, however, namely, at Kuntha Hill, 110 miles N. of Hergott, and at Leigh Creek, on the Great Northern railway line, a better class of brown coal has been found.

LEIGH CREEK was visited by the Government Geologist in February, 1889, in consequence of a discovery of carbonaceous shale at the railway tank, near to the Leigh Creek Railway Station and at Glen's Gums. He expressed his opinion that the shales were probably of Mesozoic age, that there were good grounds for assuming the presence of coal in them, and that it was desirable to test the question of the presence or absence of coal in workable quantities by boring or sinking shafts. A private company was then organised, and they sank a shaft 70ft., at which depth the great influx of water prevented further sinking. Subsequently this company, on the recommendation of the Government Geologist, received assistance from the Government, who provided a diamond drill and undertook the payment of two-thirds of the cost of boring. The bore was started at Glen's Gums on February 7th, 1890.

Age—Mesozoic, equivalent to the Ipswich coal measures of Queensland. Nature—Intermediate, probably, between brown coal and bituminous coal. In percentage of water it resembles a brown coal, but the products of combustion and distillation are those of true coal.

No. 1 Bore.—At edge of basin—At 125ft. to 150ft., coal; 150ft. to 151ft., shale; 151ft. to 170ft., coal, shale, and coal; 170ft., blue clay slate of Primary age.

No. 2 Bore.—One and a half miles from No. 1, near centre of basin—At 1,496ft. 8in. to 1,544ft. 6in., coal seam (thickness 47ft. 10in.); coal seams 2ft. 3ft. and smaller met with below. Bottomed at 1,900ft. on Primary rock.

Analyses of Coal and Physical Conditions (Main Seam, No. 2 Bore).

Depth from Surface.	Volatile Hydrocarbons.	Carbon.	Ash.	Water at 212.
1,496ft. 8in. to 1,501ft. 4in.	32.27	43.20	3.54	20.91*
1,509ft. to 1,510ft.	34.55	42.14	1.38	21.93
1,514ft. to 1,515ft.	28.60	36.46	17.08	17.86
1,516ft. to 1,517ft.	28.30	37.26	13.36	21.08
1,518ft. to 1,520ft.	28.54	42.93	10.46	18.07
1,521ft. to 1,522ft.	27.18	40.54	15.92	16.36
1,523ft. to —	26.74	44.50	11.90	17.00†
1,526ft. 6in.	24.88	45.00	10.52	19.62†
1,527ft. to 1,527ft. 6in.	23.83	43.69	16.16	16.32
1,527ft. 6in. to 1,528ft.	28.45	45.57	10.70	15.38
1,529ft. to 1,530ft.	26.88	44.24	12.05	16.83
1,531ft. to 1,532ft.	26.37	38.56	21.77	13.30
1,532ft. 6in. to 1,533ft. 6in.	24.73	42.57	18.93	13.77
1,539ft. 6in. to 1,540ft. 8in.	24.51	43.21	14.88	17.40
1,540ft. 8in. to 1,541ft. 10in.	24.68	40.75	16.56	18.01
1,541ft. 10in. to 1,543ft. 9in.	25.98	41.13	13.59	19.30
1,544ft. 6in. to bottom of seam	21.53	33.50	31.49	13.48

* Average sample.

† Two samples.

This coal was more compact than that taken from the shaft (referred to later on), and fragments of core have been kept for years without disintegration.

Analyses of Coal and Coal Shale from Various Depths (No. 2 Bore).

Depth from Surface.	Volatile Hydrocarbons.	Carbon.	Ash.	Water at 212.
1,764ft. 9in. coal	28.80	43.19	10.77	17.94
1,765ft. 6in. coal shale	19.32	33.44	38.10	9.14
1,765ft. 8in. " "	16.57	28.33	46.38	8.72
1,770ft. " " " "	17.55	18.09	58.37	7.99
1,773ft. " " " "	23.01	17.61	52.52	6.86
1,773ft. 6in. " " " "	29.03	40.25	19.65	11.07
1,774ft. " " " "	26.76	35.91	27.23	10.40
1,774ft. coal	28.22	46.48	2.68	22.62

These bands of coal and coal shale or impure coal are interstratified with shale, containing more or less carbonaceous matter, and often thin veins or streaks of coal.

Analysis of Carbonaceous Shale from No. 2 Bore.—The Government Assayer reported that the shale from 965ft. when distilled gave 3,000ft. of unpurified gas per ton, a little tarry matter and water, and a trace of petroleum.

The following table shows the percentage of carbons and bituminous matter at the various depths.

The Government Assayer's Analyses.

Depth.	Combustible Matter.	Ash.	Moisture.	Depth.	Combustible Matter.	Ash.	Moisture.
	Per cent.				Per cent.		
34ft. to 44ft.	12.00	86.00	2.00	989ft.	20.72	77.22	2.06
71ft. to 84ft.	18.18	80.00	2.00	1,040ft.	21.55	76.26	2.19
301ft. to 307ft.	20.00	78.00	2.00	1,048ft.	28.50	71.04	0.46
420ft.	19.00	79.00	2.00	1,053ft.	20.10	77.66	2.24
934ft.	20.74	78.35	1.91	1,063ft.	20.79	76.94	2.27
965ft.	19.57	79.42	1.01	1,098ft.	19.04	78.12	2.84

Mr. Cosmo Newbery's Analyses.

Depth.	Fixed Carbon.	Volatile Matter.	Ash.	Water at 212.
1,140ft.	8.30	11.75	75.45	1.50
1,141ft.	11.95	14.55	71.80	1.70
1,160ft. to 1,158ft.	8.80	14.15	73.45	3.60

He states that this shale contains a trace of free oil.

The Government Assayer's Analyses—continued.

Depth.	Combustible Matter.	Depth.	Combustible Matter.	Depth.	Combustible Matter.
	Per cent.		Per cent.		Per cent.
1,256ft.	24.4	1,273ft.	27.00	1,285ft.	18.00
1,258ft.	24.8	1,279ft.	23.30	1,287ft.	23.80
1,260ft.	15.00	1,283ft.	27.20	1,289ft.	20.00
1,262ft.	31.00				

The Government Assayer's Analyses—continued.

Depth.	Hydro-carbon.	Coke.	Ash.	Moisture.
1,730ft.	29.50	5.82	62.66	1.92
1,786ft.	30.90	5.89	61.67	1.54

A shaft was also sunk between Nos. 1 and 2 bores and a considerable quantity of coal raised from 300ft. by the company which had taken the matter in hand. This coal, although disintegrating after being exposed for some time, was used as fuel and sold. It was tested in the Government-railway locomotives, both mixed with Newcastle coal and by itself, and condemned by the departmental experts as unsuitable for the engines in use. It was considered a useful coal for domestic requirements, as it gave little smoke and burned out thoroughly.

The late Mr. C. M. Henrie supplied the following particulars regarding the workings:—"The total length and extent of coal workings in No. 2 shaft is 5,652ft., the average width of bords 10ft., and height of coal worked 7ft. The coal produced from the mine is 12,455 tons, amount sold, 8,304 tons. The direction of No. 1 bore from No. 2 shaft is S. 22½° W., distance from shaft to bore 132 chains. Direction of No. 2 shaft from No. 1 shaft is S. 37½° W., distance between shafts 21 chains. The depth of No. 2 shaft from surface is 285ft. to bottom of the coal seam. Sunk 15ft.; total, 300ft. The coal was disposed of in Adelaide, Port Augusta, Petersburg, and other towns along the line, Hergott Springs and Broken Hill. Workings—Ventilation shaft is divided into three compartments—upcast 4ft., downcast and ladderway 7ft., air carried through workings from shaft bottom by intake roadway and returns by open heading to upcast shaft. Coal is worked on the stope and room method or pillar and stall, the size of stopes and pillars left in for support is 127yds. square; rooms or stalls, that is, face of coal from 6ft. to 15ft. wide, according to nature of roof. No. 2 shaft is 50yds. from the railway line." (Government Geologist, 3-12-06.)

HILL RIVER COAL COMPANY.—Locality of operations, near Mintaro. The report of the Government Geologist, in 1894, was to the effect that the rocks in the vicinity are of too great age to contain coal measures or coal.

KUNTHA HILL is situated on the Birdsville track, 110 miles N. of Hergott Springs. The Government Geologist inspected this place in the earlier part of 1889, and obtained samples from a shaft which had been sunk. He arrived at the opinion that the coal had been deposited in lake or swamp basins, which originally had received the waters of the Diamantina and Cooper's Creek, and that there was a highly encouraging prospect of obtaining brown coal or lignite by boring or sinking. But he pointed out that the remoteness of the locality from a railway, and other natural disadvantages, such as lack of timber, water, &c., would seriously affect the work of prospecting, and would make the sinking of the numerous shafts necessary for exploration of the supposed coalfield very expensive. He observed that the clay and shale sunk through contained in abundance fragments of fossil leaves and carbonaceous matter generally, which belonged to the fresh-water beds of the Lower Tertiary or Upper Cretaceous rocks, and overlaid Marine Cretaceous formations. The following information was furnished by Mr. Niehaus, manager of the company formed to prospect the property:—Three shafts and two bores have been put down vertically, the depths of the former being respectively 70ft., 84ft., and 150ft.; and of the bores, 298ft. and 112ft., and three seams of coal have been passed through in the shafts of the thickness severally of 2ft. 6in., 2ft., and 5in. A direct, as well as comparative analysis, is appended:—

Wyoming brown coal (similar formation in western North America)—

Water	10.0
Volatile matter	38.0
Fixed carbon	49.0
Ash	5.0

Kuntha Hill coal, two samples, analysed by Mr. Geo. Goyder, jun.—

	First Sample.	Second Sample.
Water	11.68	11.00
Volatile matter.....	36.63	36.77
Fixed carbon	42.70	43.39
Ash	8.99	7.84

LAKE PHILLIPSON BORE.—The bore, which is being sunk for artesian water, has reached a depth of 2,651ft., and is in blue argillaceous shale, similar to the lower cretaceous shale of other parts of the artesian basin. In this bore several seams of brown coal, similar to that of Leigh Creek, were met with at intervals from 166ft. to 551ft. These varied in thickness from a few inches to 28ft. From 551ft. downwards the bore passed through blue argillaceous and micaceous shale, with thin sandstone, grit, and calcareous bands at long intervals. This shale was more or less bituminous at intervals to about 2,240ft., and yielded petroleum on distillation. The stratification has been horizontal all through.

Analyses.

No. 1.—310ft. 11in. to 312ft. 10in.

Ash.....	18.54 per cent.	Coke	11.64 per cent.
Moisture	8.82 "	Volatile hydro-carbons	61.00 "

No. 2.—377ft. 10in. to 393ft. 2in.

Ash.....	6.38 per cent.	Coke	33.12 per cent.
Moisture	21.02 "	Volatile hydro-carbons	39.48 "

(Government Geologist, 13-3-05)

NORMANVILLE COAL COMPANY.—Locality, the Sugarloaf, midway between Normanville jetty and Carrickalinga Head. The Government Geologist reported in February, 1892, that fragments of coal, much waterworn, were strewn over a rocky beach, apparently washed up from the sea. The presence of a coal seam was supposed, but the rocks are of a greater age geologically than any in which workable seams of coal have been proved to exist. Of such a seam there is no probability, and the presence of the fragments of coal is due to accidental circumstances.

NOARLUNGA.—Locality, section No. 80, hundred of Willunga, near the township of Noarlunga. A shaft on this section, 50ft. deep, has penetrated a lignite deposit 14ft. thick, including an interstratified band of carbonaceous shale. The deposit consists of a brown coaly shale containing carbonised wood, compressed leaves and resin, with small seams and bunches of brown coal of good quality; the formation in which it occurs is of Tertiary age, most probably Lower Miocene, the extension of which E. is cut off by rocks of Cambrian age, towards which the beds dip slightly. W. it passes beneath the Miocene Tertiary fossiliferous limestone, &c., of the Noarlunga and Willunga coastal region. There is a large Tertiary area extending along the coast from section No. 631, Noarlunga, to section No. 227, Willunga. It is divided near Noarlunga township by a S.W. spur of the Mount Lofty Range, which approaches close to the sea near section No. 359, Willunga; the Noarlunga portion of this area continues N.E. nearly to Sturt Creek, a distance of about 12 miles, and it varies in width from one to five miles. The surface of this formation is not much elevated above sea-level near Noarlunga; but at its N.E. end it caps the summit of the range, and is doubtless the filling in of an ancient river and estuary trough or depression.

As a rule the lower portions of most Tertiary deposits in South Australia contain deposits of brown coal or lignite of greater or less thickness.

The following is the report of the Analyst of the School of Mines on samples submitted by me:—

Number	1	2	6	7
	Lignite, containing Resin.	Lignite.	Dried Lignite.	Bright Lignite.
Moisture at 100 C.	15.3%	34.30	12.12	16.96
Ash.....	44.5	14.53	7.61	5.9
Fixed carbon.....	—	23.23	38.95	39.64
Volatile matters	—	27.94	41.32	37.50

The carbon from No. 6 showed a slight tendency to cake; the others were non-caking.

The deposit, as a whole, is not sufficiently good to be used as fuel. It is, however, possible that richer and thicker beds exist to the N., and these could be tested by boring at intervals across the Tertiary basin in that direction. (Government Geologist, 17-4-C6.)

In order to assist the Noarlunga Coal Company in their search for a payable coal seam, a Government drill was started at work on the company's property near Noarlunga, in December, 1906. No. 1 bore on section No. 80, hundred Willunga, passed through sandstone, clay, and slate, and at 355ft. struck the Cambrian rock. No. 2 (site selected by the Government Geologist) bore was started on section No. 337, about one mile N.W. from No. 1; it passed through sand, and at 70ft. encountered boulders, the progress through which was so difficult that the drill was shifted to site No. 3 on section No. 336, about half a mile to the S.W. On June 30th this bore had reached a depth of 296ft., passing through limestone, marl, and clay to 70ft., succeeded by sandstone and clay, with bands of fossiliferous limestone to 123ft.; then 7ft. of shale, 2ft. white drift sand, 7ft. sandstone and clay, 4ft. 6in. black slate. From this argillaceous limestone and shells continued to 296ft.

PIDINGA LIGNITE.—At Pidinga, 86 miles N. of Fowler's Bay, there is a bed of lignite outcropping on the shores of a salt lake. By shallow sinkings of a foot or two the deposit was found to extend for about $\frac{1}{2}$ mile, or all across the lake. By boring, the bed of lignite was ascertained to be 30ft. thick, and fossil resin was found to occur in it. The quality of the lignite is not good enough to allow of its being used as fuel.

PORT AUGUSTA COAL PROSPECTING SYNDICATE.—Locality of workings, near the Uno Head Station. In July, 1895, the Government Geologist examined the place, and reported that blue laminated slate or shale bearing a resemblance to coal-shale had been raised from a well. The rock formation of the country consists of quartzite, quartzose, sandstone, and clayslates, into which felspar porphyry has been intruded. The black slate in the well belongs to this formation, and is of the same age as the Flinders and other ranges, and is, therefore, too old to contain coal measures or coal.

RHINE VILLA.—In August, 1888, because of an alleged discovery of true coal, the Government Geologist paid a visit of inspection to a place near Rhine Villa, on the Murray Flats, hundred of Angas. The coal was said to have been found on the surface, and also in a bed of clay, in which a shaft had been sunk to the depth of 110ft. He came to the conclusion that the finding of these fragments of good coal in the position he saw in no way indicated the existence of coal seams beneath these Tertiary clay deposits, and that the adjoining bedrocks were, geologically speaking, too old to contain coal; that the coal found was not *in situ*, and that the only coal likely to be met with in sinking was lignite. A company was formed and boring commenced on the site of the discovery, resulting unsuccessfully. Since 1888 the Wyndham Company have put down two bores on the property without success.

SHALE DEPOSIT.—Locality, between Victor Harbor and Port Elliot. The Government Geologist, in 1892, reported that there are numerous evidences of a shale formation underlying the Tertiary beds. Where the Tertiary and alluvial beds have been washed away the shale formation is exposed. It is jointed, and varies in color from bluish green to black, and is interstratified with beds of sandstone and occasionally concretionary limestone. On section 314, Encounter Bay, many

years ago, a shaft and bore were put down, and on section 582 a shaft, 100ft. deep, both in a search for coal. Fossiliferous remains not having been met with, the age of the deposit cannot be determined. If it belongs to the Mesozoic age there is a possibility of coal existing.

In 1892-3, assisted by the Government, on section No. 415, hundred of Encounter Bay, a diamond drill bore was put down to a depth of 950ft. through a shale deposit alternating with bands of hard sandstone. No coal was found to that depth, and the tools being lost in the bore work was abandoned.

Another bore in the near vicinity reached a depth of 570ft., passing through similar strata; was abandoned for the same cause.

A third bore, completed October, 1895, bottomed on Primary rock, blue clay-slate, with quartz veins, at a depth of 964ft., no coal being found. The strata in the upper portion of the bore is similar to those of the two previous ones, except that it became more arenaceous as sunk on. From 600ft. downward the strata consisted of sandstone and boulder formation.

In No. 1 Bore, at a depth of 292ft., artesian water giving a supply of 2,400galls. per diem was struck.

TEATREE GULLY.—Twelve miles from Adelaide. Another supposed discovery of coal led to an examination by the Government Geologist in 1888. In this neighborhood there is a bed of white clay, which is mined at the depth of 100ft. for use in the manufacture of pottery, and in it a little woody lignite and some carbonaceous matter occur. He reported according to the facts, and stated that the lignite did not indicate the presence of true coal, and that there was no chance of discovery of a coal seam by boring. A company was formed and a drop-drill procured from the Government. A bore was put down; it is believed, to a depth of 249ft., when it reached solid limestone or calcareous slate. No record appears to have been kept of the strata passed through, but the first 100ft. would doubtless consist of Tertiary sands and clays, underneath which boulders or gravel would be met with resting on the bedrock.

WIRABARA.—In December, 1889, the Government Geologist inspected the locality of a supposed coal discovery near Wirrabara, hundred of Appila. He had to report that he saw no coal at the site, and that the rock formation there was of too great an age geologically to warrant any search for the mineral in that district.

WARRENBEN OIL CLAIMS.—It was stated that a discovery of petroleum had been made near Warrenben, in the S. part of Yorke's Peninsula, and the Government Geologist reported that the locality is at the base of a cliff, a short distance N.W. of Cape Spencer, where there is a cave a few feet above low-water mark. The rock formation consists of hard compact coralline and shell limestone in beds dipping slightly N., resting on gneissic and hornblendic granite; these are the oldest, or foundation rocks; they rise but a few feet above sea-level. The coralline limestone, which is of Tertiary (Eocene) age, rises from 250ft. to 300ft. above sea-level; it is permeated by cracks and pipes, or blowholes, and also by irregularly shaped vughs, which are either hollow or contain friable coralline limestone and sand. In the bottom of the cave a hole has been bored through the compact rock into one of the cavities or vughs containing the softer rock: the latter is found to possess a distinct odor of petroleum. Samples taken by me were assayed by Mr. G. A. Goyder, F.C.S., who reports as follows:—

"Kerosine Trace, less than 0·02 per cent.

Paraffin Minute trace

"The kerosine and paraffin yielded by this sample appeared to me of greater purity than is usual in subterranean products."

Mr. Chapman, analyst and assayer at the South Australian School of Mines, reports:—"I have examined the samples, fines and rock, from the Warrenben oil claim, and in neither sample can I detect any petroleum or paraffin wax, although there appears to be a trace of volatile hydro-carbons present."

The presence of pure kerosine and paraffin in this porous limestone might reasonably cause the conclusion to be arrived at that petroleum exists here; but the results of the analyses show that the other oils, bitumen, &c., usually associated with crude petroleum, are absent; the inference being that the presence of oil in the cave is casual. No beds of oil shale or coal are known to exist in the district, the Tertiary limestone resting directly on the granitic; so that there are no likely sources of supply. I regard the occurrence of oil at this particular spot as a merely local one, which may be due to the decomposition of seaweed or animal matter originally enclosed in the rock, and one which cannot be taken as evidence that petroleum will be found by boring in this district. (Government Geologist, 18-9-06.)

Some bores were put down by the company holding the claims, but so far no discoveries of oil have been reported.

BITUMEN.—An alleged discovery of bitumen and mineral oil on the sea beach at the mouth of the Glenelg River and W. was reported upon by the Government Geologist in July, 1898. He stated that no traces of bitumen could be detected on the beach, and the lumps previously found were probably erratic fragments washed up from sources at present unknown, like those found along the coasts of Kangaroo Island, Yorke Peninsula, and Port Lincoln. As to the presence of mineral oil, suggested by the local discoloration of the sea at the place visited, analysis showed that there was no mineral oil or trace of bitumen present, but finely comminuted seaweed, causing the appearance of a scum.

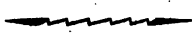
Similar discoveries have been reported from time to time in other localities, but up to the present there has been nothing found suggesting the existence of true deposits of this nature.

COORONGITE, OR AUSTRALIAN CAOUTCHOUC.—This is an indiarubber-like material, which was discovered many years ago not far from the Salt Creek, which empties itself into the Coorong, a salt-water inlet extending from the Murray Mouth for about 90 miles parallel to and a short distance from the coast. It was first observed on the surface in little hollows in the sand on a run held by Mr. Gall, and resembled patches of dry leather; it generally occurred in swamps. The theory formed was that this substance had resulted from the overflow of petroleum or rock oil, and boring operations have since been conducted at various periods, with the view of tapping the oil-bearing strata from which this peculiar substance was supposed to have exuded. The greatest depth of bore attained was somewhere about 500ft., and so far as is known the beds passed through were Tertiary sands, clays, and limestones, resting on blue claystone. An English company imported boring machinery from America, with a view of renewing the search for rock oil; and after spending £3,000 (the greater portion of which was paid for incidental expenses) gave up the quest. The late Mr. T. U. Scrutton for many years gave enthusiastic attention to the subject, but did not succeed in inducing capitalists to adventure upon a scientific search. There is a wide difference of opinion as to the origin of the "coorongite," some scientific authorities in England and America ascribing it to a vegetable origin, regarding it as a gum which has exuded from a plant or lichen; whilst others assign to it a subterranean origin. The point remains at present officially undetermined.

In 1903 attention was again called to this district by the extremely optimistic reports of some experts from America; it was stated that the presence of MINERAL OIL *in situ* had been detected in the Coolmasson Well, about 13 miles N.E. from Meningie. In order to test this the Hon. Minister of Mines, on the recommendation of the Government Geologist, had some bores put down, and on November 20th, 1903, the Government Geologist reports:—Two bores were sunk, one to a depth of 61ft., and another, which was placed within a few inches of the well timber, to a depth of 36ft. through sand, sandstone, &c., containing fresh water. There was no oil in water or sand raised from these borings. The piping in the well, when drawn out, was found to extend downwards to 35ft. from the surface. At 29ft. it contained plugs of dynamite and oily matter; this was not examined minutely, as the presence of nitro-glycerine was suspected.

As there is no oil in the strata in which the well is sunk, the oily or tarry matter found within the limits of the well timber must have been derived from outside sources. This locality is the most important one relied on by Messrs. Stoyel and others to prove the existence of mineral oil, near the surface, and consequently its presence in quantity at depth; and the boring having proved that natural oil does not exist at this place, I did not consider it worth while testing other localities in the neighborhood, where similar phenomena are alleged to have been noticed. It appears probable that the oil found here and at the other localities has been derived from the lubricating material used on the joints of the rods and casing used in boring. The rock stratification of the locality is horizontal, and consists of sand, limestone, clay, sandstone, &c., of Tertiary age, resting, so far as can be ascertained, on granite; the nearest outcrop of this rock occurs $5\frac{1}{2}$ miles W. of Coolmasson. In the lower portion of the Tertiary strata beds of lignite probably occur, but they are not likely to be oil-bearing. I am of opinion that there is no evidence of the existence of oil in this district, either near the surface or at depth, and, therefore, I do not recommend deep boring. (Government Geologist, 20-11-03.)

There have been other discoveries which have led to some hope of finding petroleum, but, so far, on investigation, there has been no substantial evidence of its existence in any quantity.



MANGANESE.

Manganese and iron ores are common in many parts of the State. The ore often contains cobalt, but not in sufficient quantity to render its working payable.

AERGUNDA.—Situated 9 miles E. from Blinman, on the Angorichina Run. A large bed of manganese outcrops on the side of a hill, with blue limestone above and below it. Yield up to 35½ per cent. of manganese, but transit expenses too great to allow of profitable working.

ELLEN, 12 miles S.E. of Gordon, the **ETNA**, 6½ miles N.E. of Gordon, and the **GORDON**, 8½ miles N.E. of Gordon, have been worked for manganese.

CUTTLEFISH.—Locality, section R, hundred of Dudley, Kangaroo Island. The Government Geologist reports that a tunnel has been driven 80ft. in a N.E. direction on a well-defined lode formation, with good walls 3ft. to 4ft. apart, dip S.E. 70° to 80°. The lode is associated with a band of crystalline marble and calcareous sandstone, and is enclosed in mica schist and mica slate rocks. No trace of gold or silver was obtained by assay of samples of the gossan and manganese ore, but the assay return for manganese was 23 per cent.

QUORN.—Locality, 17 miles N.E. from Quorn. The Inspector of Mines stated that a sample he took assayed 32 per cent. for manganese, and that good ore was in sight. (April, 1891.)

SCOTT'S is situated between Orroroo and Hammond, close to the railway line.

SOUTH AUSTRALIAN.—Locality, Boolcunda Creek, near Willochra. The company commenced operations in 1882-3, and did a considerable amount of work, winning a fair output. Mr. W. Dunn, the secretary of the company, states that there are four parallel lodes having a W. strike, one averaging 9ft. in width, and the others 2ft. to 5ft. There are five vertical shafts (deepest 75ft.), and a tunnel 140ft. One drive has been put in 80ft., and the other over 200ft. The lodes are composed of pyrolusite, manganite, and psilomelane, and the yield is now from 3,000 tons to 4,000 tons per annum. Ore has been sent away continuously during the last three or four years. (1890.)

TUMBY.—Situated about 4 miles from Tumby Bay. The inspector, reporting September 5th, 1899, states that operations had only been recently started, and consisted of a number of trial pits from 3ft. to 6ft. deep. The deposit of manganese, judging from surface indications, is large and of a good quality, but will take some time to determine. At the time of the visit over 40 tons had been dispatched, and further shipments of high-grade material were in progress. (I.M.R., 5-9-99.)

WATT'S SUGAR LOAF.—Locality, about 5 miles from Gordon. A large deposit of manganese has been worked for some time. Blocks of 10 tons to 12 tons of ore were found on the surface, and a considerable quantity was shipped to England.

WILLOWIE FOREST RESERVE.—In 1886 a deposit of manganese was found in the Willowie Forest Reserve, about 4 miles N. of Melrose. An analysis made by the Government Assayer showed that the manganese contained cobalt varying in percentage from 1.7 to 2.31. No work has been done to test the lode.

The Government Geologist, reporting generally upon mineral claims in the neighborhood of Orroroo and Carrieton, says that manganese ores are frequently seen in outcrops or "blows," some of them being very rich. These outcrops, as a rule, are not of a permanent character, although some of them will yield a considerable quantity of ore. The chief places where these occur are at McGee's Springs, Eurelia, Kinnane's, and Byerlee's, near Carrieton. There is an abandoned manganese mine on section 46, hundred of Moockra, which was worked a few years ago, when a large quantity of manganese was obtained from it, which was shipped to England, *via* Port Augusta. It has the appearance of being a large lode, with a strike N. 28° E., and a dip of 55° W. Parallel outcrops have also been worked. Manganese is known to occur or has been worked on section 11, in the same hundred; sections 168 and 178, hundred of Yanyarrie; and section 25, hundred of Bendleby.

MISCELLANEOUS.

ASBESTOS.

Oodla Wirra.—The Government Geologist reported in 1895, on Heithersay's mineral claim, that there was an outcrop showing a variety of asbestos known as mountain cork; other varieties might exist beneath.

Sailor's Gully.—Sixteen miles S.E. from Gawler. The Inspector of Mines reported in 1892 that there were small veins of asbestos dipping E. He took a good sample from a depth of 20ft. There was an abundance of "mountain cork" scattered about the surface.

Hundred of Adams.—The Government Geologist reported in 1896 that a vein of crocidolite (a variety of asbestos) 3in. or 4in. wide had been opened up, traversing crystalline limestone and calcareous, argillaceous, and arenaceous slaty rocks. The vein was too small to be of any importance, and it was questionable whether that variety of asbestos was of any value.

Bright.—Locality, 8 miles N.E. from Robertstown, and E. of section 48, hundred of Bright. In 1894 the Inspector Mines reported that a pit, about 60ft. long and 10ft. wide, had been sunk about 7ft. deep in the bed of a creek, and small irregular veins and bunches of asbestos were found, the quality varying, being worth from £6 to £15 per ton. About 6 tons were bagged.

COBALT MINE, NEAR BIMBOWRIE.—The Government Geologist, reporting on April 29th, 1901, states that the locality is about 8 miles N. from Bimbowrie Station, prospecting operations were being carried on by the South Australian Cobalt and Nickel Company. It was formerly worked by a syndicate which had, a few years before, raised some rich ore. The rock formations at and in the neighborhood of the mine consist of mica schist (with granite dykes), clayslate, calcareous sandstone, quartzite, crystalline limestone, and soft earthy sandstone and calcareous strata. The strike of the rocks is N.E., and they dip both S.E. and N.W. in anticlinal form. The workings of the original proprietors are on the N.W. side of the outcrop; they consist of shafts and trenches, the latter having been driven through soft earthy calcareous strata. The amount of ore obtained from these workings is not known, but the black gossany streaks cut through in places contain cobalt. It is probable, therefore, that further prospecting in this direction might disclose other seams or veins of ore, and a thorough examination of these old workings should be made. The cobalt ores occur chiefly in the crystalline limestone beds, which extend on a bearing of N. 40° E.; they have been found to occur along the strike at intervals for some 200ft. in several shallow excavations, the most extensive of which is 32ft. long and 5ft. deep in its deepest part. This cobalt-bearing bed is on the S.E. dip of the anticlinal, and appears to be the most important one requiring examination. The ore occurs in seams in the bedding of the limestone rock in small veins, in the joints of the rock, and also disseminated through the rock itself. The thickness of the seams of ore which are associated with calcareous and ferruginous matter varies from lin. to 5in. or 6in. as at present visible in the bottom of the excavations; these seams contain rich ore in places. The ores found include erythrite (cobalt bloom, cobalt arsenate), smallite (cobalt arsenide), cobaltite (arsenide and sulphur), and earthy cobalt (oxide associated with manganese and iron oxides).

The work recently done has been chiefly confined to sinking vertically and driving in the crystalline limestone on each side of the ore-bearing strata, so that no information as to the continuance in depth of the veins and seams of ore has been obtained; but the fact that the seams are interbedded with the rocks is in favor of this. The ore-bearing bed varies in dip from about 45° to nearly vertical. At the place where the richest ores are exposed the dip is about 45° S.E. The sinking of an inclined shaft on the ore body at this point is recommended. This would disclose the character and extent of the deposits, and at the same time enable the

company to obtain ore, and, after sinking, the ground can be opened up by drives along the strike of the rocks. By means of these operations it is probable that shoots and bunches of ore rich in cobalt will be met with in depth, and an important mine may be developed. From the ore raised by the original prospectors a bulk sample of 14cwt. 3qrs. was crushed and sampled, and on assay by the Government assayer returned cobalt 14.8 per cent. ; nickel, 0.5 per cent. Assays made for the Mines Department, from time to time, returned cobalt from 6.2 per cent. to 22 per cent. ; nickel, from 0.2 per cent. to 1.5 per cent. Six samples taken by me along the line of outcrop assayed—cobalt, from 1 per cent. to 13 per cent. ; and nickel, trace to 0.23 per cent. (Government Geologist, 29-4-01.)

Later the property was taken over by Mr. J. H. Cooke, C.E., who has worked it intermittently and obtained satisfactory results from several trial parcels. Arrangements are in progress whereby it is hoped that a dressing plant will be erected and the mine systematically developed. (1908.)

CARTAPO CREEK, hundred of Ayers.—Cobalt has been searched for here, but no details are available. Several shallow tunnels and holes were excavated in soft argillaceous and kaolinised sandstone, with limestone bands.

NICKEL MINING COMPANY, Mount Ogilvie.—The Inspector of Mines reported in October, 1890 :—From the surface down to 7ft. a vein had changed from quartz to a soft calcareous formation, from which 2 tons of nickel ore averaged 20 per cent. of nickel and about 5 per cent. of cobalt ; another 2 tons, which would return 5 per cent. of nickel and $1\frac{1}{2}$ per cent. of cobalt, had been raised.

YOUNG'S COBALT.—Situating near the township of South Blinman, between the Blinman and the Wheel Friendship Mines. The Inspector of Mines stated that he examined the claims on the 18th February, 1890, and found several tons of ore at grass : cobalt, with silver and copper. The outcrops of the lodes show copper intermixed with iron and quartz, the cobalt being found in nodules near the intersections of two lodes, the ore—erythrite arsenate of cobalt—being seen in each. It is of peach-red color, varying to greenish grey. This form of ore is the result of decomposition of other cobalt ores, and suggests the possibility that this mineral will carry down to depth. Samples assayed by the Government Assayer returned—No. 1 sample, $6\frac{1}{2}$ per cent. copper, 11.72 per cent. cobalt, 2ozs. 12dwts. silver per ton ; (2) 28 per cent. copper, 1.46 per cent. cobalt, 6 per cent. nickel ; (3) $14\frac{1}{2}$ per cent. copper, 1.15 per cent. cobalt, 3ozs. 5dwts. silver per ton ; (4) $7\frac{1}{2}$ per cent. copper, 4.89 per cent. cobalt. The Inspector of Mines reported in 1891 that the vein was 1ft. thick, and that samples assayed $2\frac{3}{4}$ per cent. of nickel and 1 per cent. of cobalt, but there had been richer ore taken out. On the footwall side there were patches of copper, nickel, and cobalt. Probably the ores would prove richer at depth.

ETHIUDNA MINE (Cobalt).—*Vide* page 53.

GYPSUM.—The principal deposits being worked at present are at Lake Fowler, and near Marion Bay, Yorke Peninsula.

KANGAROO ISLAND CHINA STONE AND CLAY COMPANY.—Workings are on section No. 79, hundred of Dudley, Kangaroo Island. This place was formerly worked for tourmaline (*vide* page 360), of which some large and beautiful specimens were found in the extensive granitic dyke mass exposed at this locality ; but as their occurrence was scarce and erratic mining for them could not be profitably carried on, and the ground was taken over by the present company, which was formed to try to put to some commercial use the large deposits of felspar (hard and decomposed), china stone, silica, pure quartz, and firebrick clay, which exist here, comprising all the material for high-class pottery (except bones) and firebricks. A small crushing and grinding mill, which, it is stated, is the pioneer pottery mill of Australia, is at work here. The plant is run by a 12-horse-power traction engine. The crusher consists of two basalt rolls, $3\frac{1}{2}$ tons each in weight, running on a similar stone embedded in concrete, and the grinder is a set of ordinary millstones. China stone (silica and felspar), felspar, and silica are ground separately, made as fine as flour,

and a market is being established amongst the potteries of Adelaide, Melbourne, and Sydney. The products have given satisfaction, but, as the potters prefer it wet ground, the present dry grinder will be replaced by a wet grinder, which has been purchased in Germany, and will arrive shortly. The machinery is well placed, and everything goes to it by gravitation; the water required is raised by a windmill.

The clay pits expose large bodies of good clay; the Broken Hill Company is using some for the linings of the zinc furnaces at Port Pirie. It has been proved very suitable for firebricks, and the erection of brickworks at Hog Bay is contemplated. There does not seem any doubt as to the purity and suitability of the materials found here, nor of the large quantities readily available; and the time may be looked forward to when possibly the main china and pottery supplies of the Commonwealth may come from this district. (D.R. (Gee), 17-11-06.)

CHINA CLAY.—The Government Geologist reported (December, 1896) the existence of a deposit of white and pink kaolin, or china clay, of good quality in a locality 2 miles N. from Yatina. It is a portion of the argillaceous slaty strata constituting the bedrock of that neighborhood.

FIRECLAY, ETC.—Pine Point, *vide* page 119.

Four and a half miles S. of Mount Lofty Railway Station.

Near Blakiston.

Burra Fireclay Company, hundred Baldina.

STREATITE.—Skinner's lease. On section 6265, hundred of Talunga, 3 miles from Gumeracha. The workings are principally on the side of a range rising steeply to the height of 150ft. above the flat, and have exposed two formations each, from 10ft. to 15ft. wide, composed chiefly of kaolinised talc material, portions of which have been worked and ground fine, and disposed of in Melbourne for various purposes. At the foot of the hill a tunnel has been driven 100ft. with the object of intersecting the talc formations, the first of which will be probably cut in another 50ft. Some 150ft. to the N. there is an outcrop of ironstone, so far undeveloped, and the surface stone appears of very poor quality. At the workings there are numerous dressed stones cut to various sizes and patterns, suitable for bakers' ovens, fire grates, stoves, &c., which should answer well for the purposes designed. (I.M.R., 29-5-00.)

MERCURY.—Hundred Myponga, 7 miles E. of Willunga. The Government Geologist (June, 1891) visited the several localities where finds were alleged to have taken place, and came to the conclusion that the bedrock of the tunnels and the alluvial drift at a shaft that had been sunk (15ft.) both contained mercury in small quantities. He recommended further prospecting.

OCHRE.—Copper King, Beltana, *vide* page 45.

Mount Sienna Mine, *vide* page 282.

North Mount Rhine.—Situating near Mount Frederick, hundred of Angas. The Inspector of Mines (1891) reported very highly of a deposit of ochre of a first-class quality in this property, which, besides, has silver and lead ores.

Flinders Range Umber, Oxides, and Ochre Mine.—Situating 12 miles E. of Blinman. Captain Doble reports that there are six lodes, varying in width from 4ft. 6in. to 50ft., the last mentioned being a very large iron lode embedded in yellow ochre and pipeclay. (1890.)

Blackwood Gully.—A deposit was found (1897) in a tunnel, which it was claimed would have commercial value as a paint basis.

Hundred Willunga.—Claim 2998.

Near Lyndhurst Siding.

MINERAL CLAIMS NEAR HOG BAY.—Ten 40-acre mineral claims were taken up, about 10 miles S.E. of Hog Bay, on a supposed discovery of tin. The Inspector of Mines visited the locality in November, 1900, and reported that the general features of the country are small creeks and low hills rising from 50ft. to 100ft. above the level of the plain, with several granite dyke formations carrying tourmaline. Towards the S. end of the claims the formation shows for over 30ft. in width, including intrusive rock. Seven chains further N. the dyke appears much

smaller, and a short distance further disappears, until, towards the N. end, it again crops above the surface, being very much larger than at the S. end. No work has been done, but samples were taken from the most favorable points. W. of the large outcrop are other similar formations, some of the outcrops standing several feet above the surface; here also samples were taken. About $1\frac{1}{2}$ miles E. of the main line an outcrop shows on the surface 2ft. 6in. wide, and on it a trial pit has been sunk to a depth of 3ft. The lode matter here looks better, but the samples taken gave no return of tin. It was stated that samples taken from the outcrops and trial pits examined yielded from 1 per cent. to $2\frac{1}{2}$ per cent. of tin oxide; but the inspector was unable to see any during his visit, and nine samples from various points on these separate formations failed, on assay, to show any tin, or any metal of value. The dykes are of the usual tin-bearing character, and possibly may be found to contain that metal; but, from the results of the samples, the prospects are not encouraging. The most simple and inexpensive way of prospecting the country would be by searching the creeks for stream tin. (I.M.R., 26-11-00.)

MICA, NEAR WILLIAMSTOWN.—Section No. 122A, hundred of Barossa, about $3\frac{1}{2}$ miles S.E. from Williamstown. Mica occurs on the surface along the rocky spur of a hill running N. and S., the country rock being micaceous schist. An opening has been made on one of the outcrops to a depth of 14ft., exposing a dyke composed of felspar, quartz, and mica about 4ft. thick, striking in the same direction as the hill N. and S. and dipping to the E. at about 60° . Mica, not compact and of a schistose character, is plentiful throughout the dyke, the sheets on the hanging wall being the largest in size. About 20ft. S.E. from this opening a shaft has been sunk to a depth of 30ft., passing through the dyke at 22ft. The mica sheets at this depth are larger than those found nearer the surface. The mica outcrops can be traced for a considerable distance to the S. The largest sheets seen by me, averaged about 5in. by 5in., and the color, as a rule, is dark and spotted with occasional patches of fairly clear. Prospecting pits should be sunk on the dyke at selected places on the outcrop in order to further test the quality and quantity of the mica, and more compact and clearer material may be expected to exist in this locality, although that already found is suitable for many purposes. (D.R. (Gee), 16-5-06.)

RUTILE.—Sections 8 and 9, hundred of Talunga, 6 miles N. from Blumberg. From time to time, for many years past, work has been carried on by various parties, but apparently in no instance has there been much enterprise or energy. The workings, which continue for about 150yds. in length, are principally a number of small shafts, cross trenches, and surface openings, from 3ft. to 30ft. in depth, disclosing a soft clay kaolinised dyke formation, from 10ft. to 12ft. wide, striking slightly E. of S. Through this material rutile crystals in various forms, both coarse and fine, can be seen, in some places dispersed throughout the matrix, in others in pockets and seams, and can be extracted by dish washing. For some distance on each side of the formation fine rutile can be obtained on the surface, but the most valuable is in a small seam of gravel resting on a clay bed about 12in. below the surface, and which yielded very good prospects indeed, much better than had been anticipated, judging from the debris on the surface, and its position not being on the line. The better class material is at each end of the workings. From each of those several samples were taken, also from the surface and shallow pits, which, when bulked, gave an average return of $1\frac{1}{2}$ per cent. In regard to the treatment of the crude ore several modes of extraction have been adopted on a limited scale, but in no instance have the operations proved a success, except the last 3 tons, which were shipped to Victoria and treated with the ball mill and Whifley table, and, from returns furnished, gave an average value of 10s. per ton for the crude ore, which is of similar value to the samples taken at the present market rate. This, with suitable machinery, and worked on a large scale, even with this low average, would prove remunerative; but previous to any large outlay being incurred in dressing appliances it would be advisable to adopt a thorough system of development and prospecting, by ascertaining the depth, width, and length of the deposit

or dyke formation, also at various points test its true value. This, from the nature of the material, would be comparatively inexpensive, and would enable a reliable estimate to be arrived at with the object of deciding on the erection of machinery or otherwise, as the prospects and quantity may justify. (I.M.R., 27-9-00.)

GREAT EXPECTATIONS.—Mount Crawford, section 119, hundred of Para Wirra. There is a fine deposit of rutile in the matrix at this mine.

SALT.—The salt industry has been steadily growing for some time past, the exports having increased from 18,824 tons in 1896 to 45,000 tons in 1906.

The chief sources of supply are the salt lakes of southern Yorke Peninsula, of which Lake Fowler is the largest, and Lake Bumbungie in the hundred of Cameron. There are also salt lakes on Kangaroo Island, notably in the hundred of Haines. Lake Hart, about 60 square miles in area, situated about 120 miles N.W. from Port Augusta, contains immense supplies of salt of good quality, which at present, owing to the distance from a market, is of no economic value. Salt lakes are also numerous in the north and in other portions of the State.

The Castle Salt Company and the Standard Salt Company are in active operation. Most of the salt exported is shipped from Edithburgh.

TIN.—Earea Dam, *vide* page 310.



GEMS AND RARE MINERALS.

DIAMONDS.—For many years there had been rumors of the discovery of gems, including diamonds, in the Echunga Goldfield. The feeling that it was desirable to test the credibility of these statements induced the Commissioner of Crown Lands in 1879 to engage the services of an experienced gem digger, Mr. G. T. Bean, to examine the district and report. He went over the field and stated that diamonds had been found in Long Gully and in other localities, and that Chapman's Gully presented features resembling those of the diamond field at Kimberley, South Africa. He added that there were also other places in the Echunga district in which it was probable that diamonds would be found, and he recommended that a systematic search for diamonds should be organised. It is stated that more than 50 good saleable diamonds have been found in the district since the first discovery made many years ago, and that the most notable gem found was Glover's diamond, which was valued at £70, whilst two small ones were sold for £10. Another was secured weighing $9\frac{1}{2}$ carats. Most of the diamonds hitherto found have been discovered accidentally in washing alluvial for gold.

A few small specimens of Echunga diamonds, including one of a red color, were purchased by the Adelaide Museum authorities.

Mount Kingston, near the Peake River.—A diamond weighing a little over 1 carat was received from this locality in 1894, stated to have been washed from auriferous gravel.

CORUNDUM.—In 1906 a discovery of corundum was made in the rough ranges which divide the watershed between Lakes Eyre and Frome; it is approximately 4 miles W. of Mount Painter and 2 miles E. of Mount Pitts on an unnamed creek which is on the E. watershed and flows N. into Bolla-Bollina Creek, running into the N. end of Lake Frome.

The Government Geologist made an examination in August, 1906, and says that the ranges in the locality are steep, rugged, and stony, forming peaks, rounded hills, and cliffs from 2,00ft. to 3,000ft. above sea level, and intersected by numerous creeks and gullies with deep ravines and gorges. The rock formations consist of gneissic, metamorphic, siliceous schist, quartzite, mica schist and mica rock, trending E. and W. and dipping S. at angles varying from vertical to 50°. These strata have been upheaved by the eruptions of granite dykes and masses which have penetrated them extensively; the prevailing granite is of a reddish yellow color, and, as a rule, contains little mica; but in some of the smaller dykes large crystals of mica occur, and tourmaline is frequently present.

The corundum occurs in the metamorphic rock, the chief matrix being a schistose rock composed chiefly, in some cases almost entirely, of mica; this rock varies in color from black to yellow and grey; it is massive and tough in structure. The corundum is seen in segregated crystalline lumps, rough hexagonal crystals, and small irregular-shaped pieces disseminated through the rock. In color it is blue, mottled, and white and greenish, and is associated with minute red crystals, chiefly rutile, which occur both in it and in the matrix. The width of the rock formation in which the mineral is visible across the strike is about 5 chains at the level of the creek, and it can be traced up the hill for a height of 150ft. or more on the weathered surface of the rock, above which it protrudes. In some places the percentage of corundum would average from 10 to 25 per cent. of the rock matrix; in others the average would be lower. In the creek boulders of the corundum-bearing rock occur above and below the outcrop, and it is most probable that other bands of similar rock exist in the vicinity.

The deposit is a remarkable one, and I am of opinion that a large quantity of corundum could be obtained here if required. Corundum is used as an abrasive, being valuable on account of its extreme hardness, which is next to that of the

diamond. In 1903 916 short tons were produced in Canada, the value of which is given as 92,940 dollars, or over 100 dollars per ton. As corundum, with sapphire and oriental ruby, is in mineral composition pure alumina, the question of the probable existence of valuable gems must be considered. Mr. G. A. Goyder, who has examined and tested some of the samples, reports the presence of fragments of clear blue *sapphire*, and of an *oriental ruby* in one instance. Mr. Chapman, Analyst and Assayer of the School of Mines, reports the presence of *sapphire* and *oriental emerald* and red transparent *rutile* in the specimens submitted to him. A yellow mineral in granite from the same place he has identified as *iolite*, and in the pannings from the alluvial wash of the creek he has also detected *monazite* in addition to the other minerals above mentioned.

I would recommend sinking in the creeks in order to test the alluvial wash for gems, monazite, &c., as there is a much greater probability of larger stones being found in the drift than in the rock matrix; shed corundum should also be found there.

As a whole the discovery may prove of importance and value. (Government Geologist, 17-8-06.)

BERYL AND EMERALD.—The holding is situated $3\frac{1}{2}$ miles from Williamstown, and has been worked at various times for a considerable period. The principal object of the prospecting has been emeralds, and up to the present operations have resulted in the discovery of beryls, occurring at times in pockets, in others scattered in a very irregular manner throughout the matrix; a large wide dyke formation of partly decomposed granite striking S.E. by N.W. On this a very irregular underlie shaft has been sunk to the depth of 33ft., at an angle of 45° , disclosing the same character of rock as appears on the surface, with portions of decomposed felspar and quartz occurring in bunches and veins crossing the granite dyke with a S. dip, the beryls usually being discovered at the point where the decomposed matter junctions with the quartz veins. At various points at the time of the visit beryls could be seen, both small and large; but in most instances when taken out are in a fractured condition, and have not the proper color to make them of commercial value. About 2 miles in a W. direction, situated on Crown lands, further prospecting has been continued by the sinking of two shafts, 10ft. and 15ft. respectively, and crosscut driven from the latter 14ft. The workings in the first opening or shaft expose a micaceous quartz formation from 4ft. to 5ft. wide, the enclosing rock being micaceous schist. This formation in places discloses beryls freely, but in most instances the prisms are not by any means so perfect as in the first place, and as they are taken out fracture and crumble into small pieces. Towards the bottom of the shaft the formation is apparently contracting. Possibly as it gets smaller and better defined many of the flaws in the beryls may disappear, and the stones become more perfectly formed. The second shaft is 15ft. in depth, and crosscut driven 14ft., but at the present depth does not show anything of importance, being simply micaceous schist with one vein of siliceous matter. It was stated that on and near the surface a considerable quantity of beryls had been obtained, which, as the shaft was continued, gradually disappeared. From general appearances, and the class of beryl obtained, it would be advisable to continue prospecting in the first place worked by sinking a vertical shaft from the surface at the point reached by the underlie shaft; then continue down where the contact of the decomposed felspar and quartz takes place. There is no doubt the formation contains the true beryl, and at a deeper level the prisms would probably become more perfect, the flaws less, and the color more of the true emerald. (I.M.R., 20-9-01.)

DAW'S DIGGINGS, ELEANOR RIVER, KANGAROO ISLAND.—*Vide MONAZITE*, page 362.

Oriental ruby (red).
Oriental sapphire (blue).
Oriental amethyst (violet).
Leuco sapphire (colorless).
Sapphire (blue).

Cyanite (blue).

Zircon.

Tourmaline.

Rutile.

OPAL, NEAR CHARLEY'S SWAMP.—Locality, about 30 miles S. from Boopiechee Railway Siding. The opal occurs in the siliceous shale that underlies the jasper rock and flint of the table hills and stony downs formation, occupying joints, fissures, and veins of irregular thickness which traverse it at varying angles and sometimes horizontally. Some of the opal possesses a play of colors in what appear to be minute fissures in the translucent and vitreous stone; common, white, and black opal, opalised wood, and chalcedony are associated in these veins.

Precious opal is supposed to differ only from common opal in possessing microscopic cavities and fissures in the stone, which refract light in different directions. The opal found here may be considered as an inferior variety of precious opal, and it is probable that stone possessing these properties in a more marked degree may be discovered later. The rock formation is of similar age (Upper Cretaceous) to that in which opal is found in New South Wales and Queensland, and consists of horizontal beds of white and bluish siliceous shale and sandstone, capped with jasper rock, flint, and porcelainised shale, forming low table hills with stony flats and sandhills.

This is, I believe, the first authentic find of anything really approaching the precious opal in this State. (Government Geologist, May, 1904.)

LAKE HART OPAL.—The discovery at Lake Hart is situated near the S.W. corner of the lake, and about 6 miles W. of Wirraminna Station. The strata here consists of sandstone, with flint, quartz, jasper rock, and other stones resting on horizontal white sandstone, forming cliffs rising some 50ft. above the lake shore. The bands of opal are embedded like veins up to an inch in thickness in the sandstone. The opal is brittle and laminated; in color it is yellow, grey, and white, and has a vitreous and resinous lustre. It does not reflect a play of colors, except in fractures, and therefore must be classed as common opal; but it is possible that the precious variety may be found in these rocks by further search. (Government Geologist, 25-2-02.)

TOURMALINE (GEM).—Locality, section No. 79, hundred of Dudley, about 10 miles by road from Hog Bay, Kangaroo Island. The rock in which the gems occur is a granite, which has been intruded into metamorphic micaceous sandstone, the prevailing bedrock in this part of the island. The granite varies from coarse micaceous to graphic granite, and is kaolinised and decomposed for several feet from the surface. The area occupied by this dyke mass has not yet been ascertained, owing to its covering of sand and clay; but it will probably be found to be of considerable width and length. The gems are found in pockets and other clay seams and bunches, associated with quartz crystals and large crystals of mica and felspar, sometimes in considerable quantities. They also occur in the quartz and felspar of the coarse granite, and also in fine-grained micaceous granite. Ordinary black tourmaline is also associated with the colored varieties. The tourmaline occurs as striated, rhombic, prismatic crystals of various diameter and length, broken fragments, and segments of prisms. The varieties found which may be regarded as gems include pink tourmaline (rubellite), blue tourmaline (indicolite), and green tourmaline. Two different colors are often associated in the same crystal—the green crystal having a pink centre, and the blue and green colors showing in the same crystal; the shades of color range from light to dark. A beryl crystal has also been found. The workings consist of open excavations, shallow shafts, and short drives made in the soft, decomposed granite in searching for the pockets or bunches in which the gems are chiefly imbedded. These are met with at irregular distances in sinking and driving, and there appears to be no defined line which can be followed for them. A shaft has been sunk at one place about 50ft. into hard, undecomposed granite. The gems have been hitherto obtained from the decomposed granite only, because of its soft, friable nature; but they will in all probability

also be found in the solid rock itself in a similar manner, and the question of continuing operations into the harder ground must be determined by the commercial value of the gems. The occurrence of the gem-bearing centres is so erratic that all prospecting in this connection must necessarily be more or less at haphazard. The cut stones present a very beautiful appearance, and those having pink centres and a combination of blue and green colors are particularly interesting, and will probably be found to have special values. The area available is large, but prospecting is difficult owing to the prevailing covering of surface clay and other deposits. (Government Geologist, 14-4-04.)

CARNOTITE.

Locality, about 2 miles S.S.W. of Teesdale's dam and about 20 miles E.S.E. of Olary Railway Station. The ore occurs as yellow and greenish-yellow incrustation and powder on the faces, joints, and cavities of a lode formation, which consists of magnetic titaniferous iron, magnetite, &c., and quartz in association with black mica (biotite). In some specimens the latter mineral adheres also to the containing rock, giving the formation a dyke-like character. There are two of these lode outcrops running more or less parallel at distances of from 5yds. to 15yds. apart. The main outcrop can be traced for some 200yds., either continuously or intermittently, or as indicated by surface stone scattered on the loam and other surface detritus. The smaller outcrop can also be traced in the same way, but for a longer distance. The ore incrustations are visible in the matrix at intervals along the outcrops, but are best developed along some 50ft. of the more solid and continuous portion, which has a thickness varying from 2ft. to 3½ft. The trend of these outcrops is N. 39° E., and they traverse metamorphic gneissic micaceous granite and granite schist, into which dykes of granite and diorite have been intruded. These rocks are variable and irregular in strike, but in a general way it is N.E. No work has been done, and the ore so far has only been obtained from the outcrop protruding above the level of the surface.

Judging from the persistent character of the lode itself in length of outcrop and its width, where visible, I am of opinion that it will be found to extend to a considerable depth. From the fact that the carnotite occurs as incrustations it appears most probable that it has been derived from the solution and redeposition of other uranium compounds below, and that, therefore, such ores in addition will be found by exploration in depth. Mining operations with a view to ascertain these points are, therefore, amply justified. The analyst and assayer at the School of Mines has made a special analysis of a small bulk sample, and reports that it contained .28 of uranium oxide (U_3O_8). He was unable to collect sufficient of the carnotite incrustation from the specimens supplied to him to make a complete analysis of the mineral itself, but reports that it contains 60 per cent. of the uranium oxide and a considerable proportion of vanadic acid. He states that the mineral is chiefly carnotite, and that a little gummite was also detected by him. This mineral is regarded as an alteration product of pitch blende.

Specimens were forwarded to Professor Bragg, of the Adelaide University, and writing on May 11th, he says: "I found the radio-activity to be somewhat less than that of a layer of pure uranium oxide of about equal dimensions. But this is the only test I have made, and to prevent misunderstanding I should like to call your attention to the fact that no other conclusion can be drawn from the one test than that the substance contains radio-active material. The percentages of uranium and radium, for example, could not be deduced, nor any information as to the stone being of commercial value. I should, however, like to make further tests from a scientific point of view. The whole subject of radio-activity is so new that each fresh opportunity of investigating the circumstances in which radio-active substances are found is of value. Although the proportion of radium to uranium is now known to be almost invariable, yet there are exceptions. There may be such an exception in the Olary find, or there might be some new radio-active material or some unusual juxtaposition of substances." (Government Geologist, 14-5-06.)

MONAZITE.

In August, 1906, monazite was detected in the pannings of alluvial creek wash from near Mount Painter.

In October, 1906, monazite crystals, in small veins and vughs in the quartzite, were found at King's Bluff in small quantity.

In February, 1907, waterworn crystals were detected with alluvial gold pannings at section No. 83, hundred Para Wirra.

In the same month a sample from the Eleanor River, Kangaroo Island, was forwarded to the School of Mines. The analyst and assayer reported—"The sample of sand was found, on examination, to consist of quartz, rutile, monazite, tourmaline, zircon, &c. Monazite is a phosphate of cerium, lanthanum, didymium, and other rare earths; it usually contains some thorium, and it is upon the proportion of the latter substance present that its economic value depends. Monazite is worth from £4 to £5 per unit of thorium oxide. The sand submitted yielded, on analysis, 0.45 per cent. thorium oxide, and on the above basis of valuation shows a value of from £1 16s. to £2 5s. per ton. The sample appeared to have been concentrated, and would of course be capable of further concentration. I estimate the sand to contain about 7.5 per cent. monazite, so that it would appear that the clean mineral would contain about 6 per cent. thorium oxide."

This discovery was reported on by the Government Geologist in April, 1907. The locality is about 28 miles W. from Kingscote, and is known as Daw's Diggings. It was prospected for gold in 1897, and examined by me in 1898, when small prospects of alluvial gold associated with rutile and zircon were obtained in the alluvium of the river and from older drift deposits in higher ground; these workings were subsequently abandoned. On my recent visit I found that Mr. H. G. Taylor had been prospecting in the same locality, and in doing so had demonstrated the presence of monazite, which he has obtained chiefly from the sand, clay, gravel, &c., raised by Daw from the old shafts, and also in a lesser extent in the alluvium of the river. Judging from the old holes, the depth of sinking on the higher ground varies from 15ft. to 20ft. I obtained a small quantity of the monazite sand resulting from the washing operations, and on examination and analysis, in addition to monazite and rutile, small gems of the following varieties were found to occur in the finer siliceous sand contained in the sample:—Aluminium oxide—*Oriental ruby* (red), *Oriental sapphire* (blue), *Oriental amethyst* (violet), *Oriental topaz* (yellow), *Leuco sapphire* (colorless), *sapphire* (blue); aluminium silicate—*Cyanite* (blue), *zircon*, and *tourmaline* were also present.

An analysis of the monazite crystals separated by hand from the sand obtained was made by Mr. Goyder, who reports that it contained 8.4 per cent. of thorium (oxide of thorium). Rutile is the most plentiful of the minerals found to occur here, and it probably exists in sufficient quantity in the drifts to be of economic value. The presence of the varieties of corundum mentioned above, although the specimens are of small size, indicates the possibility of the existence of larger and more valuable stones, and also that of other species not yet detected.

I understand that the separation of monazite from the other constituent minerals is practicable, and, as the percentage of thorium oxide is high, it is possible that marketable results may follow this find. The formation in which it occurs is of Tertiary age and occupies a considerable area of tableland country in the central portion of the island; it is similar in character to the "deep leads" in which gold is found, and should be prospected in the same manner, viz., by shafts, to trace the runs of washdirt and determine the positions of the deeper ground, in which the richest deposits may be reasonably expected. (Government Geologist, 9-4-07.)

VANADIUM.

Discoveries have recently been made at Paull's Consolidated Copper Mine, the Leo Vanadium (Paull's North), and at the Mount Burr Mine, all in the Leigh Creek district.

At Paull's the ore has been found in 12 different places along the lode for a distance of $\frac{1}{2}$ a mile, as yellowish green stains and coatings in the joints and crevices of the copper-bearing slate rock, and in small vughs and crevices in the copper ore. So far it has not been obtained deeper than 18ft.

At Paull's North, as similar stains in cuprite and grey copper ore, and also in the joints of the siliceous slate rock in which the copper ore occurs.

At Mount Burr, sparingly in stains and coatings of the crevices and joints in grey copper and copper carbonate ore; this at two places $1\frac{1}{2}$ chains apart. In all cases no defined vein of vanadium ore has been observed.

Sample from Paull's North yielded, on analysis, 0.12 per cent. of vanadium, which existed in the surface as vanadium ochre. (Government Geologist, 8-12-04.)

Vanadium ochre has also been found at Clarke's Mount Lyndhurst Mine, Booleroo Springs, and the Mountain of Light. (8-12-04.)

CARNOTITE, Associated with.—*Vide* page 361.

EDELWEISS MINE.—*Vide* page 50.

METALLIC MINERALS, EARTHY MINERALS OF ECONOMIC IMPORTANCE, AND GEMS,

With Chief Localities at Present Known.

METALLIC MINERALS.

[For details, look up records within of the mines mentioned.]

ANTIMONY—

Sulphide and oxide.—Mount Fitton Mine. Atimomial lead ore.—Aclare Mine.

ARSENIC—

Arsenical iron pyrites.—Glen Bar and Talisker Mines, near Victor Harbor, Woodside Gold Mines, and Section 1610, hundred of Waitpinga, Preamimma Mine, near Callington.

BISMUTH ORES—

Native bismuth, bismuth ochre, bismuth sulphide, and carbonate.—Balhannah, Murninnie, Mount McDonnell, Sir Dominic, Stanley, and Daly Mines, Freeling Heights, Mount Freeling, Burrawing Mine, Mount Ogilvie (associated with nickel), Grundy Mine at Second Valley, Mount Rugged, N.N.E. of Blinman, New Era Mine, Forest Range, Teetulpa, Morialta, Paralana, Mount Fitton.

CASSITERITE (oxide of tin).—

Earea (Wilgena district). *Vide* page 310.

COBALT AND NICKEL—

Bimba Hill, Bimbowrie—Erythrite (cobalt bloom, hydrous cobalt arsenate), smaltite (cobalt glance, cobalt arsenide), cobaltite (arsenide and sulphur), and asbolite (earthy cobalt oxide, associated with manganese and iron oxides). Nichol's Nob and Mount Ogilvie—Smaltite (nickel, cobalt 23.5 per cent., and arsenic), gersdorffite (nickel 35.1 per cent. sulphur 19.4 per cent. arsenic 45.5 per cent.), and erythrite (oxide of cobalt 37.6 per cent., arsenic acid 38.4 per cent., and water 24 per cent.). Young's Cobalt Mine, S. of and near Blinman Mine—Erythrite and nickel, associated with copper ore and silver. Flinders Range Mine, 2 miles from the Blinman—Cobalt and nickel, associated with copper ores and silver and gold. Mount Ogilvie West—Nickel associated with bismuth. G.E. Reserve 21, hundred of Ayers, near the Burra. Cartapo Creek, near the Burra, and Gum Creek, near Willowie—Cobalt, associated with manganese. Glen Bar, Mount Ogilvie—Cobaltite (arsenic, sulphur, and cobalt). Gill's Bluff, Mount Ogilvie—Ullmanite (nickel, antimony, and sulphur). Tomkinson Range—Quartz stained with nickel. Ethiudna Mine—(Cobalt, associated with copper). Nicholl's Nob—Annabergite (arsenical nickel). Wortupa—Melonite (telluride of nickel).

COPPER—

Lodes containing copper ores may be found to a greater or less extent over nearly all the area where the Primary rocks outcrop. The Moonta lodes, which are the most important that are now being worked, are enclosed in felspar porphyry—an eruptive rock intruded into granitic and metamorphic country. The Kapunda copper deposits are in argillaceous slates

and kaolinised rocks of various colors, accompanied by dark-blue pyritous slates. The Burra Burra copper ores were worked in siliceous slates, crystalline limestone, and argillaceous slates and sandstone. The Blinman Mine is in an ore-bearing stratum of siliceous limestone, intersected by veins and lodes of ore; igneous dykes of granite and greenstone are intruded into argillaceous slates, sandstones and quartzites forming the country rock. Intrusive dykes of greenstone and other igneous rocks have been noticed as connected with other lodes. Boulder conglomerate, argillaceous and calcareous slates, dolomitic limestone, quartzite, micaceous slates and sandstones also constitute the country rocks enclosing copper lodes. In some instances gold and silver-lead ores are associated with the copper ores, and more rarely bismuth is present. Baryta, ferri-calcite, quartz, ironstone, gossan, and calcspar are some of the chief accompanying constituents of the lodes.

Atacamite (oxichloride), azurite (blue carbonate), bornite (variegated pyrites), chalcocite (copper glance), chalcopyrite (copper pyrites, copper, and iron sulphide), chrysocolla (silicate), cuprite (red oxide), malachite (green carbonate), native copper. These, and also rarer ores, are found in variable association throughout the numerous copper mines of the State. Localities and occurrences will be found particularised in the Copper Section, and a detail list here is therefore unnecessary.

GOLD—ALLUVIAL.—

By alluvial gold is meant gold which has been derived from the denudation and disintegration of rocks containing auriferous veins by the action of natural forces, the principal agent being water. It is found (1) scattered through the surface deposits covering the bedrock, and sometimes lying upon it; and (2) in gullies which have been watercourses, which have become filled with alluvium washed into them from higher ground in their vicinity; and (3) in deep leads which are alluvial deposits of Tertiary age that filled the beds of ancient Tertiary watercourses at a time when the drainage of the country was on a larger scale, and often in a different direction to that now existing. To a great degree these deposits have been denuded, and fragmentary sections alone remain as cappings on the hills; but in some instances they conform to the contour of the present valleys. The Pliocene drifts of the Barossa Ranges and those covering a considerable area of country in different parts of the main range down as far S. as Cape Jervis belong to this category. The Adelaide Plains are also underlaid by similar deposits, as well also as most of the flat country along the main creeks and valleys in many parts of the colony.

There is a probability of alluvial gold, *i.e.*, gold that has been denuded from its matrix, being found in the older Tertiary (or Miocene) rocks, which are understood to have been deposited in lakes and estuaries; and in the conglomerates and gravels of Mesozoic age. Gravel and sand drifts have been proved by boring beneath both the older Tertiary and Mesozoic rocks, where they doubtless fill the basins and channels of ancient lakes and rivers belonging to these periods. The presence or absence of gold in them depends on the proximity of older auriferous rocks from which they were derived by denudation.

The auriferous conglomerate of Algebuckina, on the Neales River, may be of Mesozoic age.

BAROSSA. Hundreds of Barossa and Para Wirra.—In Tertiary gold drifts and deep leads at Cottiers', Edwards', Goddard's, Green, Hitches', Red, and Victoria Hills; Melville's Rush, Simmons', and White Leads; Bismarck's, Simms' Paddock, and at Yetti Hill; in alluvium at Bullocky, Devil's, Gollop's, Green Hill, Hamlin's, Hissey's, Mary's, Moonta, Nuggetty, Spike, and Vixen Gullies, and at South Para River, section 586.

ECHUNGA, Hundred of Kuitpo.—At Chapel, Windlass, Poor Man's, and Little Bendigo Hills; Chapman's, Break of Day, Diamond, Donkey, German, Hahndorf, Little Bendigo, Long, Sailor's, Sawmill, and Simond's Gullies; Wattle Flat, Bell's Point, Christmas Rush, and Hough's Paddock. On the Onkaparinga River, Bigg's Flat, Pennyweight Flat, Seaman's Point, Black Sand Corner, Hack's Bridge, &c.

JUPITER CREEK.—At Dead Horse, Long, White, and Foster's Gullies and Surface and Golden Points.

HIGHERCOMBE.—Sections 3239, 3242, Yatala.

MOUNT CRAWFORD and **GUMERACHA**, Hundred of Para Wirra.—At Avenue, Baynes', Dead Horse, Kerosene, Sailors', Snake, Speck, Spring, and Watts' Gullies, and near Kersbrook.

Near **WILLIAMSTOWN**.

TEETULPA.—At Brady's, Brennan's, Flack's, Goslin's, Strawbridge's Dam, and other gullies.

ULOOLOO.—At Coglein's and Scrubber's Camp Creeks and White Lead.

GLENLOTH.—North-Western District.

BLUMBERG, Hundred of Talunga.—On the following sections, namely:—Nos. 116, 6396, 6624, 6625, 6337, 6332, 6334, 6572, 1673, 6511, 6510, 6524, 6558, 6113, 6060, 6154; and sections 1287, 1288, and 1289, known as the Mount Pleasant Diggings, and others.

MONTACUTE MINE, Sixth Creek.—Along the Torrens River from Mount Pleasant to Adelaide, Fifth Creek, Uraidla, Forest Range, Inglewood and Morialta.

MOUNT COFFIN.—Leigh Creek District.

BLACKWOOD GULLY, Hundred of Kuitpo.—Sections 23, 626.

MCTAGGART'S PADDOCK.—Section 22, Kuitpo.

BLACKFELLOW'S CREEK, Hundred of Kuitpo.

BULLAPARINGA.—Second Valley, Encounter Bay.

HUNDRED MOOROOOROO.—Sections 777, 810, 813, and others.

MEADOWS.—Hundred of Kuitpo.

MOFFA.—Hundred of Belvidere.

MYPONGA.—On sections 9 and 287, near the junction of the Meadows Creek with the Finnis River.

WOODSIDE, Hundred of Onkaparinga.—Near the Bird-in-Hand and other reefs; and on section 5230, Mount Torrens.

WOODFORD ESTATE.—Hundred of Onkaparinga.

LYNDOCH, Hundred of Barossa.—On section 3250.

ONKAPARINGA.—Section 5172 and others adjoining.

NORTH PARA RIVER, Hundred of Barossa.—On section 586.

KING'S BLUFF.—Mellor's Gully, about 4 miles from Olary Railway Station.

BOOLEROO SPRINGS.—Twelve miles N.E. of Leigh's Creek Railway Station.

BILLY'S SPRINGS.—Near Mount Fitton, N.E. of the main range.

YUDNAMUTANA.—About 60 miles E. of Farina.

WALLACE'S GULLY.—Near Daly's Bluff.

TWIGHAM.—About 2 miles E. of the Ulooloo Diggings.

RIESCHBEITH'S WELL and **CALLANA**.—In the Mount Nor'-West Ranges.

ALGEBUCKINA.—On the Neales River, North Railway Line.

MINTARO.—Near the township (sec. 2153).

MOUNT OGILVIE.—Near Tower Gap, Mount Lyndhurst Run.

ANGIPENA.

Alluvial gold has also been found and in some instances worked to a limited extent at Waukaranga, Wadnaminga, Mannahill Reefs, Giles' Nob, Noarlunga, Kangaroo Island, Callawonga and Station Creeks (Waitpinga), Cutaway Hills, Leigh's Creek, at the Peake, Dennison, and Mount Dutton Ranges; Clarendon, Currency Creek, Macclesfield, in the Port Lincoln and Franklin Harbor Districts, Hundred of Coglein (near bore), Quartzose Peake (Mount Lyndhurst Run).

GOLD IN VEINSTONE—

In South Australia gold occurs in the several matrices undermentioned, viz.:—(1) quartz reefs; (2) iron oxides (limonite, hematite, gossan, flucan, etc.); (3) pyrites (ordinary iron pyrites and arsenical pyrites); (4) kaolin and silico felspathic decomposed veins and dykes; and (5) ferri-calcite (carbonate of lime and iron).

The associated valuable ores and metals are galena or silver-lead, native bismuth and its carbonate, native copper, and ores of nickel, cobalt, and arsenic.

In quartz reefs the gold is often visible to the naked eye, and in some cases in pieces of considerable size; but in the ironstone and gossans it is often so fine as to be invisible. In pyrites this latter is almost always the condition, no gold being visible until the pyrites has been ground up. The kaolin and silico felspathic veinstones are generally small and often irregular, the gold occurring in them in flat, nuggetty pieces, and flat leaves and filaments, and often separated by long intervals of barren sections in the vein. They are apparently decomposed igneous intrusions associated with veinstone.

The occurrence of nuggets in the alluvial drifts may often be due to the denudation of the soft argillaceous strata in which these veins have been formed, and not alone to quartz reefs, which are generally regarded as the matrices of nuggetty gold.

Auriferous quartz reefs occur in gneiss, granite, micaceous and hornblende schists, and metamorphic sandstone and quartzites; in argillaceous slates and sandstones; in dolomitic limestones and slates; and in brief, in all the known Primary rocks. Granite, diorite, porphyry, and other granitic dykes are often found traversing the gold-bearing rocks in the neighborhood, or associated with the auriferous veins. The presence of auriferous veins is generally indicated by outcrops of quartz, ferruginous quartz, hematite, limonite, and other oxides of iron in reefs conforming to the strike and bedding of the country rocks, or cutting across them at varying angles. Their underlie varies from vertical to nearly horizontal, and their width or thickness from many feet to a few inches. Their bearing or "strike" is generally more or less meridional, although E. and W. in some districts. The character of the quartz varies greatly; opaque, transparent, granular, dense, opalline, and ferruginous quartz, have all been observed to contain gold. The upper portions of auriferous veins are generally oxidised, the sulphide of iron being converted into oxides, but this is not invariably the case. The gold exists in shoots, i.e., portions of the reef which are auriferous may be followed down continuously to considerable depths, while other portions along the course of the reef are barren, or else contain a much less proportion of gold.

Small branch veins or "leaders" running across or into the main vein are often richer than the main vein, or the latter is more highly auriferous near the junction. Iron and arsenical pyrites are more or less auriferous in all auriferous veins, but may vary in richness in a similar manner to quartz.

Particulars as to localities are furnished in the Gold section, commencing page 196.

IRON—

Hematite, limonite (oxides).

Angaston, Barossa, Beltana, Bismarck, Burra, Blumberg, Clinton, Cutana, Crystal Brook, Eurelia, Gladstone, Gum Creek, Huddleston, Hawker (E. of), Iron Knob and Iron Monarch, Koolka, Kapunda, Kersbrook, Mount Jagged, Normanville, Oodla Wirra, Peralilla, Pernatty Lagoon, Point Lowly, Port Lincoln, Pandurra, Para Wirra, Quorn (Donnelly's quarries).

At or near these localities iron ores occur in workable deposits. The most extensive deposits are at Iron Knob and Iron Monarch and at Cutana, for details of which *vide* Iron section, page 331.

Small and untested ore bodies are also found at Bugle Ranges (near Macclesfield), Flinders Range (12 miles E. of Blinman), Hahndorf, Laura (near to), Mount Barker, Mingary, Olary, Hindmarsh River, Scrubbers' Camp (near the Burra), South Rhine, on Benowie and Boolcoomata runs, also 12 miles N. of Bimbowrie Head Station. Oxides of iron are common in connection with most lodes and quartz reefs above water-level. Iron pyrites, arsenical pyrites, and cupriferous iron pyrites are found below the water-level in many localities where these outcrops occur. Pyrites generally contains gold, and at the Alma Mine, Waukaranga, formed its principal matrix.

Ilmenite, titanite iron, chief matrix of carnotite.—Near Olary.

MERCURY.—Near Willunga.

MOLYBDENITE.—

Yelta, Moonta, Wallaroo, and Kurilla Mines, near Franklin Harbor, Waterfall Camp, 25 miles S.E. of Mount Pleasant.

MICA—

Mount Crawford, near Williamstown, &c.

RUTILE—

Balhannah, near Angaston, Encounter Bay, Lyndoch, Tanunda, Echunga, Victor Harbor, Meadows (S.), Gumeracha Diggings, Mount Crawford, Hundred of Talunga (sections 8 and 9), Morialta, Noarlunga, Daw's Diggings, Eleanor River, Kangaroo Island, Oonatra Water, near Mingary.

SILVER-LEAD—

Veins containing argentiferous ores are, in South Australia, always associated with galena, or sulphide of lead, and cerussite, or carbonate of lead, with or without ores of copper. These veins may occur in any part of the area occupied by Primary rocks, and are found chiefly in fissure lodes. There is an exceptional instance in the case of the Ediacara Mine, where the silver-lead deposits occur as segregated masses in a soft argillaceous bed, where also crystalline dolomitic limestone possesses veins of galena and carbonate of lead, and occasionally fahlerz ore. Most of the silver-lead lodes contain a percentage of zinc blende (sulphide). Chlorides and iodides of silver have been found in the Ediacara, Fifth Creek Central, Mount Malvern, Eagle, and other mines. Arsenides and phosphates of lead have also been observed. Gold also occurs in association with silver-lead in the ores of Eukaby, Wheal Ellen, and other mines. Baryta, calcspar, quartz, gossan, ironstone, &c., are some of the chief associated veinstones.

Anglesite (sulphate of lead).—Wilpena Pound.

Cerussite (lead carbonate).—In all silver-lead mines above water-level.

Cerargyrite (silver chloride).—Mount Malvern Mine, Mingary, Mount Freeling, Ediacara, Eagle, Fifth Creek, Almanda, &c.

Fahlerz (argentiferous tetrahedrite).—Ediacara Mine.

Galena (lead sulphide).—Found in all silver-lead mines.

Pyromorphite (phosphate of lead).—Glen Osmond, Franklin Harbor district, Strathalbyn Mine, Avondale Mine, Farina, Hahndorf, Eukaby.

Wulfenite (lead molybdate).—Avondale Mine.

TUNGSTEN—

Scheelite (tungstate of lime).—Mount Fitton.

Wolframite.—Port Victor.

URANIUM—

Carnotite (uranium and vanadic oxides, &c.)—20 miles E.S.E. of Olary Railway Station (radio active).

ULLMANITE (See COBALT and NICKEL).**VANADIUM—**

Sulvanite, a new mineral, containing copper, vanadium, and sulphur—Edelweis Mine, section 1, hundred of Apoinga. Vanadic ochre—Paull's Consolidated, Gow's, Great Mount Lyndhurst, Mountain of Light, and Mount Burr Mines, Booleroo Springs, Sweet Nell Mine, and Carnotite locality.

ZINC—

Smithsonite (zinc carbonate)—Mount Fitton Mine. Sulphide (zinc blende) associates with galena (sulphide of lead) in many of the silver-lead mines. Zinc (native)—Forest Range.

EARTHY MINERALS.**ASPHALTUM—**

Bitumen, mineral pitch.—Found at several points on the coast from Mount Gambier to Fowler's Bay; apparently washed up by the sea; an erratic occurrence. No deposits have yet been found *in situ*.

ASBESTOS AND CROCIDOLITE—

Hundred of Adams, Angaston, Hundred of Bright, New Mecklenburg, Tungkillo, Lobethal, Mine near Menge Town, Animath Place, German Pass, Barossa Range, Umberatana, Arkaba, Sailors and Watts' Gully (Gumeracha), near Arkaroola Creek, near Wootana, near Mount Barker, Belvidere Range, Flinders Heights, near Mount Fitton Mine (Billy's Springs); Oodla Wirra.

BARYTA—

Sulphate of barium, Heavy spar.—Hundred of Talunga, sec. 3696, Mount Mulga (near Boolcoomata), Saltia, Teetulpa; these are solid lodes, the one at Mount Mulga being an exceptionally large deposit. Baryta also occurs in many of the copper and silver-lead mines.

COQUIMBITE (copperas)—

E. and N. of Mount Margaret, at the Mound Springs.

Water	28.65 %
Silica and silicate of alumina	13.50
Sulphuric acid	30.81
Ferric oxide	18.56
Alumina	2.60
Undetermined (lime, magnesia, and soda)	5.88

100.00

CALCITE—

Crystallised carbonate of lime occurs freely throughout the State as a veinstone in connection with metallic minerals. See MARBLE.

COAL.—

Mesozoic Coal.—Leigh Creek, Kuntha Hill, Oorowilannie Swamp, Warri-ninna, Lake Phillipson bore, and has been met with in several bores sunk in the Mesozoic basin for artesian water.

Carbonaceous Shale.—Leigh Creek and Lake Phillipson bores.

Lignite.—Hindmarsh Island, near Adelaide Railway Station, Coffin's Bay (near Port Lincoln), Echunga (deep leads), Mirrabuckina Bore (near Lake Torrens), Nailsworth (near Adelaide), Pidinga (86 miles N. of Fowler's Bay), Point Douglass (near Port Lincoln), Port Wakefield (8 miles from), Teatree Gully (12 miles from Adelaide), Murray Flats, Noarlunga, &c.

Coorongite.—Salt Creek, on the Coorong; found on the surface of a swamp on sand, in patches resembling pieces of dried leather. Although this substance is of a very similar composition to elaterite (mineral caoutchouc) there is a doubt as to its being a mineral. By some scientific authorities it is regarded as an exudation from a plant or a lichen, and by others as mineral oil evaporated to a solid form. *Vide* page 350.

CORUNDUM—

Mount Crawford, between Mounts Pitt and Painter, in extensive deposits.

CHLORIDE OF SODIUM (common salt)—

As a surface deposit encrusting the mud beds of coastal and inland lakes, *e.g.*, the Coorong, Lake Hart, Lake Eyre, Kangaroo Island, Yorke Peninsula, etc., and in the neighborhood of the mound springs of the interior. In solution in the water of many wells and lakes in various parts of the colony, and in the waterholes of the inland rivers running into Lake Eyre.

FELSPAR—

Kangaroo Island, in large and very pure deposits, and elsewhere wherever granite rocks occur.

FLINT—

In the older Tertiary limestones of Mount Gambier, MacDonnell Bay, and Bunda Cliffs (Nullarbor Plain), Rivoli Bay. Table Hill and stony downs formation of the N. plains.

FLUORSPAR—

Paramatta Mine, Moonta Mine, Field River, and Parara (in limestone), Kapunda Mine, Alma Mine, Tarcoola, Western River, Kangaroo Island.

GYPNUM (sulphate of lime)—

Wallaroo Mine, Hummock Range, Kanyaka, Kapunda, Wirrialpa, Lake Alexandrina, Beltana Mine, Brighton, Nichol's Nob, Salt Lakes of Yorke Peninsula, the N. plains (including the Lake Eyre and other lake districts), the tableland and stony downs country generally, N. of Marion Bay, Lake Fowler (Yorke Peninsula), N.W. of Port Augusta.

GRAPHITE (Plumbago)—

Sleaford Bay, Warrow, and Koppio (Port Lincoln district), Mount Charles (Woodside), Mount Torrens, Flaxman's Valley, Amianth Place, near Tumbly Bay, Bimbowrie, Cleve (Franklin Harbor district), Mount Dutton.

KAOLINITE—

Mount Lofty Ranges, Hundred of Dudley, Kangaroo Island, and of frequent occurrence in all districts.

MANGANESE—

Cold and Wet Station, 8 miles from Coonalpyn Railway Station; Ellen Mine, 12 miles S.E. of Gordon Railway Station; Etna Mine, 6½ miles N.E. of Gordon; Gordon Mine, 8½ miles N.E. of Gordon; Tumbly Bay; Scott's Mine, on railway between Orreroo and Hammond; South Australian Mine, Boolcunda Creek, near Willochra; Watts' Sugarloaf, 5 miles from Gordon; Willowie Forest Reserve, 4 miles N. of Melrose (this manganese contains 1.7 to 2.81 per cent. of cobalt). Manganese has also been discovered near Carrieton, Orreroo, and Eurelia (McGee's Springs, Kinnane's, and Byerlee's); also 16 miles N.E. of Carrieton. It is also common in small quantities in various other parts of the colony. Pyrolusite—Gordon; psilomelane—Gordon; wad—Parakylia; rhodochrosite—Barossa.

MAGNESITE (Carbonate of Magnesia)—

Flinders Range, near Port Pirie; Hundred of Cunningham; Oolabidnie Creek, Blinman; Mount Lofty and Barossa Ranges; National Park, Amianth Place and German Pass, MacDonnell Ranges, Glen Osmond.

MARBLE and CRYSTALLINE LIMESTONE—

Kapunda, Angaston, near Franklin Harbor, Second Valley, Yankalilla, Ardrossan, Curramulka, Carrara Hill, Amianth Place, Sixth Creek, Mount Barker, Macclesfield, Flinders Heights, Billy's Springs, Tumby Bay, &c.

MONAZITE—

King's Bluff, N.E.; Eleanor River, Kangaroo Island; section 83, Hundred of Para Wirra; Mount Painter.

OCHRE—

Red, yellow, associated with ferruginous lodes and other deposits, in numerous localities. Mount Sienna Mine, *vide* page 282.

PHOSPHATE OF LIME (Rock Phosphate)—

Sections 348, 349, 350, 351, 356, and 405, Hundred of Clinton, Yorke Peninsula; section 4, hundred of Bright, near Burra; Hundred of Belvidere, near Kapunda, sections 1551, 1436, and 1437; Hundred of Belvidere, near Koonunga, sections 88, 115, and 116; Hundred of Kuitpo, sections 293 and 294; Hundred of Cunningham, Yorke Peninsula, section 30E; Hundred of Noarlunga, near Hackham; Hundred of Bendleby, sections 2 and 28; Bickers and Brothers Islands (rock and bone breccia); sections 214, 222, and 224, Hundred of Reynolds. Section 65, Hundred of Willunga.

PHOSPHATE OF ALUMINA—

Section 1551, Hundred of Belvidere; sections 21, 42, and 60, Hundred of Pekina; section 30E, Hundred of Cunningham.

PHOSPHATE OF IRON—

Grampus Range, 11 miles from Netley Station, 30 miles N. of Orroroo, Angaston, Mount Rufus, near Strathalbyn, Rowland's Creek, Elder's Rock, Paratoo.

SOAPSTONE (var Talc)—

Lyndoch Valley, Rowland's Flat, near Gumeracha.

SULPHUR—

Native—Echunga, Montacute Mine, Waitpinga. With baryta—Spring Creek, Mount Remarkable. With Melanterite—Weathered Hill, Blanchewater, Mutooroo (5 per cent. copper, 37 per cent. sulphur).

GEMS, ETC.**AMETHYST** (Oriental)—

Mount Painter, Kangaroo Island (Daw's Diggings).

AGATE—

All over Central Australia, from Hergott Springs N., and on the Diamantina River and Cooper's Creek.

AQUAMARINE—BERYL—

Mount Crawford and Barossa Ranges, Hundred of Dudley, Kangaroo Island.

CHALCEDONY—

Angaston, Charley's Swamp, North Para, Redruth, Wallaroo Mine, Ardrossan, cliffs at mouth of Onkaparinga River, Barossa Ranges, Flaxman's Valley, Mount Barker, Kapunda, Blanchewater, Innamincka, and the stony downs and table hill country of the Lake Eyre region.

CHIASTOLITE—

Near Bimbowrie, N.E.

CYANITE (Blue)—

Kangaroo Island (Daw's Diggings.)

DIAMOND—

Echunga, in alluvium, with gold, Mount Kingston.

EMERALD (Oriental)—

Mount Painter.

GARNET—

Kanmantoo, Bundaleer, Monarto, Yabmana, Belvidere Range, Mount Barker, Hundreds of Talunga and Kuitpo, Mount Babbage, Coffin's Bay, Mutooroo, Kohinoor G.M., Kangaroo Island, &c.

HELIOTROPE (Bloodstone)—

Stuart's Creek.

HYALITE (Opal)—

Munno Para Hills, Mulligan Springs.

HYDROPHANE (Opal)—

Flaxman's Valley, Hundred of Dudley, Kangaroo Island.

JASPER—

Tableland and stony downs country of Lake Eyre, Diamantina, Cooper's Creek, Yudnamutana, Callana, Willowran, Lake Phillipson.

LAPIS-LAZULI—

In white granite, Murray Scrub.

LYDIAN STONE—

Stony downs country of Lake Eyre, Diamantina, and Cooper's Creek.

OLIVINE—

Mount Gambier, Mount Schanok.

OPAL (Common)—

Angaston, Mount Crawford, Nuriootpa, Yudnamutana, Kelly's Well, near the Peake, Flaxman's Valley, Charley's Swamp, Hergott District (agatised wood and opal), section 337, Hundred of Hawker, Lake Hart.

OBSIDIAN—

Has been found in alluvium and on the surface generally in round button-shaped pieces all over the province, although most frequent on the stony downs and table-hill country of the Far North, where its presence, so far away from any volcanic centre, is most difficult to account for.

RUBY—

Mount Painter, Kangaroo Island (Daw's Diggings).

SAPPHIRE—

Mount Painter, Kangaroo Island (Daw's Diggings).

SERPENTINE—

Sailor's Gully, Gumeracha (verde-antique), Mount Crawford, Iron Knob, Tumby Bay, Port Lincoln.

TOURMALINE—

Angaston, Ardrossan, Mount Crawford, Moonta and Paramatta Mines, Mount Boothby, Barossa Range, Encounter Bay, Rapid Bay, Mount Torrens; black—in felspar, in quartz, and in mica, crystallised—in nine-sided prisms with summits of the primitive rhombohedron—in felspar and with tombac brown mica, Flinders Heights, Moonta Mine, near Port Augusta, Wallaroo Bay; section 70, Hundred of Dudley, Kangaroo Island; rubelite (red), indicolite (blue), green, and black.

TOPAZ—

Mount Painter, Kangaroo Island (Daw's Diggings).

ZIRCON—

Mount Painter, Kangaroo Island, Jupiter Creek, near Echunga.

d in the State of South Australia Annually since 1840.

IRONSTONE FLUX.		LIMESTONE FLUX.		PHOSPHATE ROCK.		CRUDE SALT.		OTHER METALS AND MINERALS.	TOTAL VALUE.
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Value.	
Tons.	£	Tons.	£	Tons.	£	Tons.	£	£	£
—	—	—	—	—	—	—	—	—	nil
—	—	—	—	—	—	—	—	—	390
—	—	—	—	—	—	—	—	—	127
—	—	—	—	—	—	—	—	—	6,436
—	—	—	—	—	—	—	—	—	13,484
—	—	—	—	—	—	—	—	—	142,251
—	—	—	—	—	—	—	—	—	174,190
—	—	—	—	—	—	—	—	—	320,943
—	—	—	—	—	—	—	—	—	219,547
—	—	—	—	—	—	—	—	—	365,464
—	—	—	—	—	—	—	—	—	310,516
—	—	—	—	—	—	—	—	—	374,778
—	—	—	—	—	—	—	—	—	176,744
—	—	—	—	—	—	—	—	—	94,831
—	—	—	—	—	—	—	—	—	155,557
—	—	—	—	—	—	—	—	—	408,042
—	—	—	—	—	—	—	—	—	458,839
—	—	—	—	—	—	—	—	—	373,282
—	—	—	—	—	—	—	—	—	411,018
—	—	—	—	—	—	—	—	—	446,537
—	—	—	—	—	—	—	—	—	452,172
—	—	—	—	—	—	—	—	—	547,619
—	—	—	—	—	—	—	—	—	542,393
—	—	—	—	—	—	—	—	—	601,624
—	—	—	—	—	—	—	—	—	620,112
—	—	—	—	—	—	—	—	—	824,501
—	—	—	—	—	—	—	—	—	752,231
—	—	—	—	—	—	—	—	—	616,383
—	—	—	—	—	—	—	—	—	627,092
—	—	—	—	—	—	—	—	—	574,020
—	—	—	—	—	—	—	—	—	550,000
—	—	—	—	—	—	—	—	—	648,200
—	—	—	—	—	—	—	—	—	806,226
—	—	—	—	—	—	—	—	—	770,590
—	—	—	—	—	—	—	—	—	700,303
—	—	—	—	—	—	—	—	—	762,386
—	—	—	—	—	—	—	—	—	602,317
—	—	—	—	—	—	—	—	—	563,425
—	—	—	—	—	—	—	—	—	409,749
—	—	—	—	—	—	—	—	—	352,909
—	—	—	—	—	—	—	—	—	347,238
—	—	—	—	—	—	—	—	—	420,558
—	—	—	—	—	—	—	—	—	461,425
—	—	—	—	—	—	—	—	—	401,715
—	—	—	—	—	—	—	—	—	490,833
—	—	—	—	—	—	—	—	—	343,804
—	—	—	—	—	—	—	—	—	275,083
—	—	—	—	—	—	—	—	—	319,938
—	—	—	—	—	—	—	—	—	369,089
—	—	—	—	—	—	—	—	—	348,803
—	—	—	—	—	—	—	—	370	263,645
—	—	—	—	—	—	—	—	792	267,001
—	—	—	—	—	—	—	—	48	204,051
—	—	—	—	—	—	—	—	190	234,490
—	—	—	—	—	—	—	—	2,961	247,515
—	—	—	—	—	—	—	—	723	255,080
—	—	—	—	—	—	—	—	598	237,857
—	—	—	—	—	—	—	—	1,346	285,951
—	—	—	—	—	—	—	—	560	264,849
—	—	—	—	—	—	—	—	1,357	451,611
—	—	—	—	—	—	—	—	411	431,259
—	—	—	—	—	—	—	—	1,839	522,478
—	—	—	—	—	—	—	—	680	498,375
1,932	46,712	—	—	1,000	1,000	40,000	12,000	81	571,371
9,687	27,091	43,440	6,516	3,000	3,000	40,000	12,000	198	531,783
1,483	48,577	44,498	4,791	5,000	5,000	32,500	13,000	1,261	573,796
1,226	33,852	31,940	4,791	5,850	5,850	55,000	27,500	2,209	820,465
1,328	156,232	119,878	16,098	14,850	14,850	167,500	64,500	15,624	£27,308,351

† Incomplete.

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I N D E X.

NOTE.—The letters (c), (s-l), (g) indicate copper, silver-lead, and gold.

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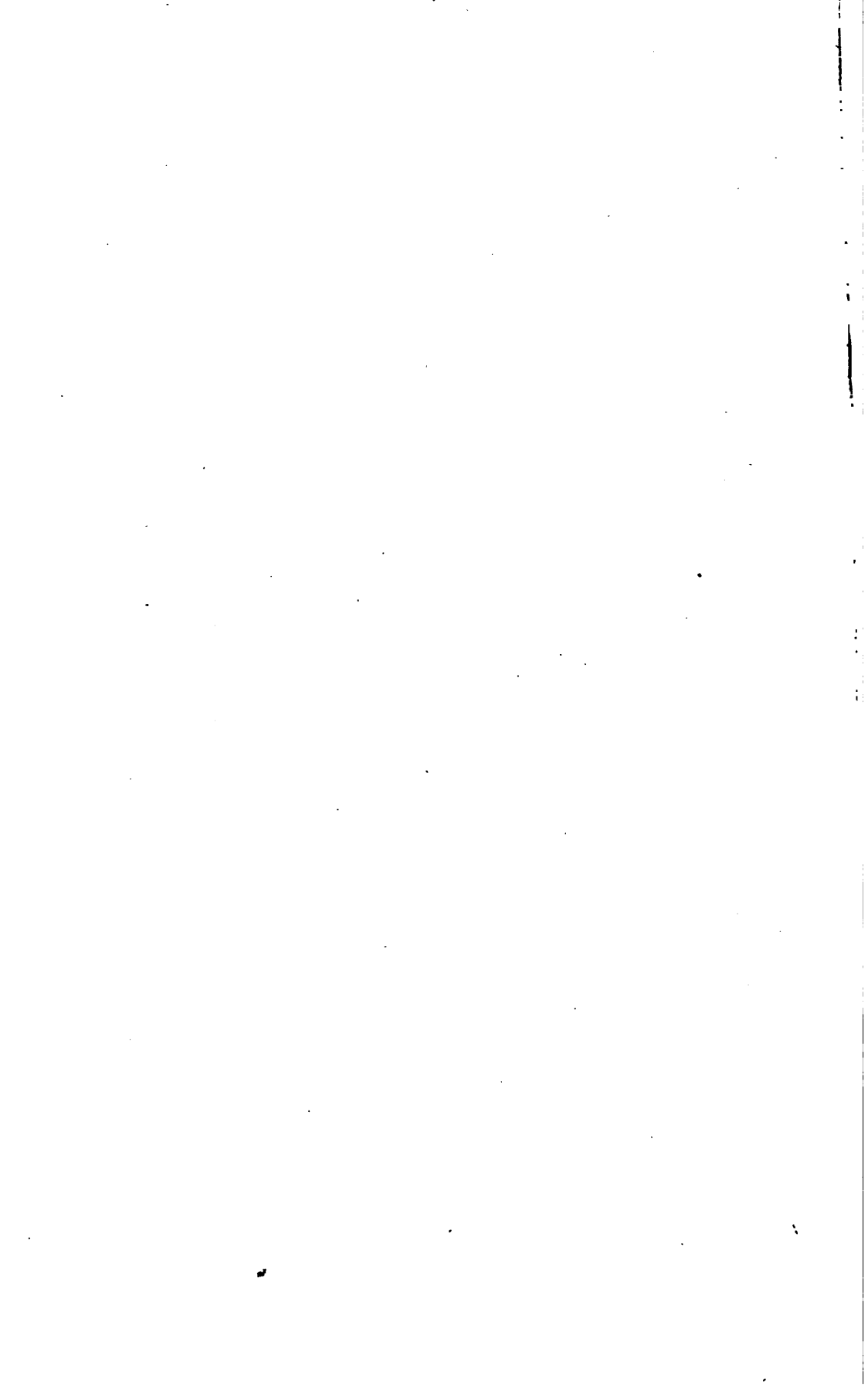
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