RECORD

OF

THE MINES OF SOUTH AUSTRALIA.

FOURTH EDITION.

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:

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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 of 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. and 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 indentated 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, diorites, 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 stratagraphic relationship can only be determined by exhaustive geological survey and mapping.

Fossils.

Ethmophyllum hindei	Protopharetra (?) scoulari
Coscinocyathus tatei	Olenellus pritchardi
Microdiscus subsagittatus	Dolichometropis tatei
Ptychoparia australis	P. howchini
Orthisina compta	Ambonychia macroptera
Platyceras etheridgei	Ophileta sublangulata
Stenotheca rugosa	Salterella planoconvexa
Hyolithes communis	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.

Alethopetris australis
Oleandridium (?) fluctuans
Thinnfeldia odontopteroides
Unio eyrensis
Macrotæniopteris winamattæ
Podoramites 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, porcelainised 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
Magasella deformis
Scutellina patella
Lovenia forbesi
Oxyrhina woodsii
Voluta pagodoides
Turritella aldingæ
Dentalium mantelli
Lima bassii
Pecten aldingensis
P. flindersi
Glycimeris cainozoica
M. pectoralis
Salenia tertiaria
Cassidulus longianus
Fibularia gregata
Aturia australis
Fusus sculptilis
Natica aldingensis
Dimya dissimilis
Pecten consobrinus
P. eyrei
P. hochstetteri
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
Latirus approximans
Murex anceps
Campanile triseriale
Calyptræa crassa
Heligmope dennanti
Ostrea sturtiana
Spondylus arenicola
Pecten antiaustralis
P. palmipes
Lima semicostata
Lithodomus brevis
Cucullæa corioensis
Cardita dennanti
Meretrix sphericula
Corbula ephamilla
Lucina nuciformis
Tellina lata
Myadora corrugata
Plesiastræa st. vincenti
Ancillaria orycta
Marginella hordeacea
Cominella subfilicea
Semicassis subgranosa
Diastoma provisi
Natica subvarians
Ostrea arenicola
Placunanomia ione
Lima jeffreysiana
P. consobrinus
Amussium lucens
Mitylus submenkeanus
Barbatia simulans
Trigonia acuticostata
Cardium mediosulcatum
Dosinia grayii
Panopæa orbita
Loripes simulans
T. basedowi
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	Palorchestes
Nototherium	Macropus
Phascolomys	Thylacoleo
Sarcoptilus	

Aves.

Genyornis (Newtoni)	Phalacrocorax

Reptilia.—Crocodilia: 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, Bundey, 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 fluviatile 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 14¾ 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, 1846, 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 ore ground equivalent to a produce of 300 tons is in course of being taken down. A considerable extent of useful buildings for workshops, &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 twe 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 10 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 already have 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 upwards 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. Morphett, 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 $1\frac{3}{4}$ 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 wore 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 570 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, Wicksteed, 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 Parks 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 Parks, 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 50ft. and a height of 40ft. At the same level, on 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 chalco ite. (I.M.R., 4–2–91.)

ANNESBURY'S CLAIM.—Situated about 10 miles N.E. from Belton. Here a formation consisting of ferricalcite, 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 ferricalcite, 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 1in. 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 stoping 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 45¼ per cent.; a general sample gave 7¼ 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 58½ 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, 98½ tons of ore were sent away, the gross value being £968. (27-8-02.) During the last six months of 1906, 76¼ tons of 30 per cent. ore were treated, and during the first six months of 1907, 101½ 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 ¾ 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 heaps 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	10¼%	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.—Situated 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. Tributers 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 1½ 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 17¾ 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 ½ 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 stoped 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 ½ a mile N. from the Wheal Forest. 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, 2ozs. 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 N. 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 siliceous nature ; at times ore of good grade has been obtained. The enclosing rock is hard shelving clayslate, 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 ½ 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 a high angle, and penetrated by granite dykes, quartz, and ironstone reefs.

Bingo (Wallaroo Central).—From this mine, adjacent to the Wallaroo Mine, it is believed that considerabie 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° 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 15cwts. of 4½ per cent. and 5 tons 3cwts. 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 19cwts. 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 unminerlike 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 restarted 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 one 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.
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> 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 sulphuret, 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 few 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 4½ 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 tenaceous 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 5¼ 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 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 the 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 7½ 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, Morphett'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 Morphett'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 Morphett'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 Morphett'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, consistin 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 1½ 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 2½ 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 Bobertstown. 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 developments 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, 18dwts. 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 brace 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 6½ 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 3in. 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 footwall 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 costeaning 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").—Situated 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

(I.M.R., 22–3–07.)

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 extraeted 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, 28¾ per cent., 6 per cent., and 28¾ per cent. for metallic copper. The country rocks are claystone and calcareous clayslate, with limestone bars. Well worth testing to a greater depth.

COLLINY 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. 25° E., and underlies nearly vertical to the S.E. The shaft was sunk near the footwall 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 clayslate, 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 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 footwall 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 oxides 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.—Situated N.W. from Walparuta Springs, Outalpa. Twelve tons, 8 per cent. copper ore raised from a shallow open cutting.

Copper King Mine.—Situated 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 24¼ per cent. The prospects were considered very encouraging for the limited amount of work done. (I.M.R., 17-11-99.)

Copper King.—Situated 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 10 cwts. 3qrs. copper ore, £295 1s. 10d.; 16 tons 9cwts. pigments, £47 19s. 1d.

Copper Top.—Situated 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 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 carbonates 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-deigned 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 (Benowrie).—Situated about 4 miles W. of Benowrie 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 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 1½ 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 a 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 3½ miles from Goolwa, close to 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 5½ 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 6½ tons of first-class copper ore were 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.—Situated 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 has 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., 32¾ 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 I 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.—Situated 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.—Situated 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.—Situated 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 manganese 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 170ft. 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 cen., 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 clayslate, 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 ¼in. 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 4½ 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 9½ 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 has 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. end. 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, 11¾ 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	9¼ "
N. and S. opening, 6ft. deep	7¾ "
Centre lode opening, 15ft. deep	11½ "
Centre lode, red oxide, same opening	28¼ "
S. lode, W. drive, 50ft. level	18 "
S. lode, E. drive, winze, 50ft. level	6½ "

This is 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 12¼ 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 28¼ 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 11¾ 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, 3⅞ 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; duobtless 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 ½ a mile in length, and expose a clayslate 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 7½ per cent. had been sent to the smelters, and a sample taken from the ore raised gave 7¼ 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 ½ 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 ¼ 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 4½ft. 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 50ozs. 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 LYNDHURST (also known as "Clark's Mount Lyndhurst").—Lies about 1¼ 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 chalcocite, 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 chalcocite 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 35¾ 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 stope 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 ¼in. 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* KITTICOOLA, page 70.

GREAT COPPER BELL.—Situated about 2½ 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 footwall 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.—Situated 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.—Situated about 1 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 ferricalcite 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 chalcopyrite, 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 22⅝ 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 a 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	61¼ 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.—Situated 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 20¼ 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 Koona 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 tributers, 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 small 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 bedrock 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	¼ "	"
" 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, 1897, 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 71½ per cent.; the silver is in very small proportion, in six samples not reaching 5ozs. 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 6¼ 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 3¾ 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 ½in. 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 ⅛in. 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 has 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 4½ 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 overlaying 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 18½ 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 Harcus'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 opper 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, Harts, 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 tributers 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 shaf 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 above that 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 ½ per cent. of copper were excavated and treated. After being washed, and by this means concentrated to about 2½ 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 c. (21cwts.) q.	%	%	%	Tons c. (21cwts.) q.	%	%	%	£ s. d.
1870	765 10 2	26	32¼	23⅛	374 17 1	59¼	62¾	57⅛	21,347 15 2
1871	1,317 18 2	21	23¼	14	249 19 2	66⅖	80	63	21,584 8 6
1872	1,730 13 0	13½	20	8⅞	51 8 1	59⅞	73⅜	34¾	19,186 15 3
1873	1,838 15 2	13 6/16	22⅜	8⅝	155 15 0	66⅜	78½	17	21,971 16 10
1874	1,391 12 2	14	17 7/8	9¾	121 13 1	60 7/16	79⅛	24	17,385 2 6
1875	1,250 13 0	14⅛	19¼	9 7/8	129 4 0	63 0/16	81¼	25⅜	16,681 5 4
1876	1,428 10 1	15 1/16	20¼	12⅝	120 6 0	69	82⅛	35⅜	17,350 10 11
1877	1,194 17 1	15 3/16	16 6/16	11 7/8	190 12 2	65	81⅛	38⅝	16,026 4 5
1878	314 7 2	16	17 4/16	14	91 0 2	76 1/16	84⅛	31 9/16	5,649 11 0
	11,235 20 0	16 8/16	—	—	1,484 16 1	64¾	—	—	£156,883 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 ½ 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', 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 distrinct 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 1½ 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 bunchy, 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, dated 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. 3grs. 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. 9⅜d. 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 yet been 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, 1dwt.; copper, ¾ 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 19½ 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, 4½ per cent. The lowest was—Gold, 2dwts.; copper, ¼ 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,	10¼	per cent.
"	0	10	"	"	5¾	"
"	1	2	"	"	nil	
"	1	1	"	"	6¾	per cent.
"	0	12	"	"	2¼	"
"	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 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.	..	$7\frac{3}{4}$ per cent.
" bottom drive lode, 4ft. wide	11 "	..	1 "
" " " " 6ft. "	16 "	..	$12\frac{1}{2}$ "
South drive lode, 5ft.	—	..	$2\frac{1}{2}$ "
" stopes " 9ft.	13dwts.	..	$1\frac{1}{2}$ "
" " " 9ft.	15 "	..	$7\frac{3}{4}$ "

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 $2\frac{3}{4}$ per cent. of copper, and the latter returning 10dwts. of gold and $1\frac{1}{3}$ 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 S.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 has 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 trace of copper could

be seen. On the surface there was a small parcel of dressed ore. A sample assayed 23¼ 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 20¾ per cent. and 20½ 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 32¼ 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 1½ miles N. from Paull's Consolidated. Several parallel veins of calcspar and ferricalcite strike S. 70° E., and underlie at a flat angle to the N.W.; they vary in thickness from 1in. 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 ferricalcite 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 3½ 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 25½ 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 undesirable, 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 Artepena Trig. and 3 miles E. from Artepena 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 ¾ 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 ½ 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 costeaned 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 clayslate, 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 9¼ per cent. copper, 12½ per cent., 7¾ 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 Benowrie 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 21¼ 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 clayslate, 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 sates 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	17¾	per cent.
Bulk sample from dump, for future treatment ..	2¾	"
" " " " " ..	1¼	"

(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, ¾ 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." —Situated 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 respecitvely. 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 at 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 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 5¼ 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 this 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.

MELDALTIE COPPER AND SILVER MINE.—Situated 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 58⅛ per cent. copper ; (2) ironstone, 30¼ per cent. copper ; (3) azurite, 6ozs. of silver, 19¼ per cent. copper ; (4) malachite, 21¾ per cent. copper. (1890.)

A departmental report in June, 1907, states :—" Situated 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. of copper. (I.M.R. (Jones), 22–8–07.)

MONSTER LODE.—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 Lofty 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 Mooloolloo 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, 1½ 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 clayslate. 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 Widman'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 calcspar 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 5¾ 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. Tributers 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., has 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 distance 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 vertical. 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 cerusite. 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 2½ miles S. from Billy's Springs. Mr. Harrison, prospector, reported to the Mines Department (September, 1889) 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 $48\frac{5}{16}$ per cent. Other parcels sent for treatment by the E. and A. Copper Co., over 11 tons, gave 52½ per cent., and about 7 tons gave 42⅜ 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.
dwts.	grs.		dwts.	grs.		per cent.
2	0	.....	2	21	.....	13·2
1	17	.....	3	23	.....	10¼
5	10	.....	6	0	.....	18¾
1	3	.....	4	13	.....	15¼
2	7	.....	4	5	.....	12¼

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 29¾ 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 lease 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 has 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 7½ 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 11cwts. 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 minerals 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 the 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, ironstained 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 15½ 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 7½ 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.)

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 ½ an acre. The limits of 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 12¾ 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 it 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 ¼ 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	¾ per cent.
No. 2 shaft	1¼ "
No. 3 shaft, partly sorted	1¾ "
No. 3 shaft, bulk	3 "
Opening, 20ft. deep	2½ "

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

Mount Arden.—Situated 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 1½ 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.—Situated 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, Freeling 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 4cwts. 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), 35¾ and 4dwts. 17grs. gold per ton; and (4), 36 per cent. and 4dwts. 12grs. of gold. (1889.)

MOUNT MULGA MINE.—Situated 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 hornblendic 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 slate. (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).—Situated 4 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 samples 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 satisfactory 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 blocks 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 were 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 where 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, 2¾%; 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 Mooloolo 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 ¾ 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 ½ per cent., and gold 1oz. 14dwts., copper ¾ per cent. per ton respectively, which is satisfactory and encouraging. About 25ft. E. a small opening has disclosed a similar formation; sample taken gave 5½ 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 20½ 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 7½ 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 8½ 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 1¼ 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 chalcopyrite, 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 ¾ 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 wihch 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 ½ a mile from the main shaft, prospecting shafts have proved its continuity in the same line of strike, viz., N. 20° E. and a 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 ½ 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 ½ 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, 7¾ per cent. copper; sample 2, veinstone, 1dwt. gold per ton; sample 3, veinstone, 17¼ 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 5dwts. 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 a 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 3½ 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 26⅝ 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 Wooltana. 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 ½ a mile E., consisted of an open cut in gossany 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, consited 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 15¼ per cent. of fine copper. Sample taken from a small vein at 60ft. assayed 23¼ 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, 26¼ 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 1½ 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 is 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 4½ 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 rock, 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 goossan 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 52¾ per cent. and 40¼ 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 "Easther'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 found not 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.—Situated 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.— Situated 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 bed 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, 6½ tons of low-grade ore had been picked from the dumps and sent away; 3½ 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 ½ 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 12½ 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 1½ 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 1½ tons of dressed ore have been marketed, and of this 1 ton realised 28 per cent. and ½ 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 cystals of atacamite. (Govt. Geologist.)

Oraldana Mine.—Situated about 5½ miles W. of Wooltana 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 2½ 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 cupriferous 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 acioular 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 chalybeate and spathic iron and copper pyrites. The mine was worked in former years, and it is believed large qauntities 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	27¾ "
" (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. The mine has been worked recently, and a shaft is down to about 200ft. It is now stated 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 the 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 ½ 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 9¾ per cent. and 10¼ per cent. (I.M.R., 6-7-00.)

In August, 1902, it was reported that no developmental work was in progress. Six tributers 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 already 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 compressers, 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 stope 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, 2½ 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 Tumby 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 goldfields, 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.

wide, 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-feet 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 feet-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-feet 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 3¼ 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 tributers, 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 15¼ 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 to 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 cleared 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 1½ 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, 1in. to ½in. thick, accompanied by a band of copper-bearing claystone 6in. to 8in. 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 interlaminate 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. 23¼ 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 ½in. 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 (Gunyah).—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 1¼ozs. of gold per ton. Samples taken on a second visit, and assayed by the Government Assayer, gave (1) copper 35¼ per cent., gold 16grs.; (2) copper 27¼ per cent., gold 2dwts. 6grs.; (3) copper 18 per cent., gold 10dwts. 10grs.; and (4) copper 3¼ per cent., gold 4dwts. 2grs. During 1893 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 32½ 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 8cwt. 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* KITTICOOLA, 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 ½ 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, 2 ft. 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 23½ 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 5 ft. 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 11¾ 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 fluccan 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. (Februray, 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 5½ 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 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 calcspar 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.—Situated 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 stoped 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 2¾ 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 1in. 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 Depot 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 litle 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 170ft., 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 worked 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 4½ft. About ½ a 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, 1¾ miles from the Monalena 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 ½ a 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.—Situated 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 1in. 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 4¾ per

cent., 5¾ per cent., and 6¼ 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 160ft. 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 the 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 1½ 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 ironstone 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. Stoping 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 25 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* KITTICOOLA, 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 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 180ft., 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 in 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 51¾ 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.

VOCAVOCANA.—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 chalcopyrite. 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. Chalcopyrite 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 21cwts.), 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 chalcopyrite 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 chalcopyrite 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 chalcopyrite 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. Chalcopyrite 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 chalcopyrite. Sometimes, indeed, it is pure chalcopyrite, 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 3⅛ 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 chalcopyrite. 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 chalcopyrite 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 employés, 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 employés 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 employés 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. 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 employés at June, 1905	2,260
Maximum number of employés	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 employés, June 30th, 1907, 3,104; the previous maximum number of employés 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.

Developmental 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 1½ 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. (J.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:—Situated 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 the 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 Wooltana 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 ½ 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 ½ 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 ¼ 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 2¼ 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. (I.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 ¼ 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 deposists 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 Yadnamutana 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 clayslate. 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 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, 2¼ 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 lavendar-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 (MCUNT CULTALGA).—Worked both for copper and gold. Situated 1½ miles S. of old Boolcoomata Station. The lode is very large, and consists of 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	6½ per cent. copper
No. 5.	" "	4 " "

(I.M.R., 19-2-00.)

WHITFORD'S.—Situated about ¾ 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"). —Situated about 4 miles N. from Wooltana 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 150ft. 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, ferricalcite, 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 clayslate. 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 clayslates, claystone, calcareous clayslates, 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 26½ per cent. for copper, fine tailings 14½ per cent., and veinstone from the bottom of the shaft 10¼ 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, 17¾ 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' 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. Chambers' 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 5½ per cent. copper per ton, and that no stoping had been done below the 540ft. level; beneath this about 600ft. of drives and winzes had 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. (J.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 surface, 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 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 goood 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 old 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, 2½ 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 cupriferous 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 $8\frac{1}{4}$ per cent. to $16\frac{3}{4}$ 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 E. 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. N. 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.—Situated 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.—Situate 38 miles N E. from Adelaide.

FROME COPPER MINING SYNDICATE.—Three mineral leases, situate 3 miles S. of Allioota, on the Angepena sheeprun, near Beltana.

GRAND JUNCTION MINE.—Situated 45 miles N.E. from Adelaide; worked in 1867.

GREAT BRADFORD MINE.—Situated 4½ miles from Finniss Flat.

HALLETT'S MINE.—Situated within 2 miles from Reynella.

HAMLEY EXTENDED.—Situated near Moonta.

HART'S MINE.—Situated S. of Ardrossan.

HORSESHOE VENTURE.—Situated on the Onkaparinga River.

MAGILL MINE.—Opened in 1846, and worked a short time.

MORPHETT'S MINE.—Situated 51 miles N.E. from Adelaide; worked about 1867.

MORTLOCK'S MINE.—Situated 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.—Situated 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, situated about 3½ 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.—Situated 7 miles N.E. from the Boolcoomata Mine.

WHEAL ACRAMAN.—Ten miles E.N.E. from Adelaide, near the Montacute Mine (1854).

WHEAL ALFRED.—Situated 10 miles E.S.E. from Keyneton.

WHEAL BARTON.—Situated near Angaston.

WHEAL BESSIE.—Near the Port Lincoln Syndicate's workings.

WHEAL GOYDER.—This was situated near the Paramatta Mine, and stopped working about 1874.

WHEAL HARMONY.—Situated 25 miles E. from Adelaide.

WHEAL MARY MINE.—Locality, 25 miles E.S.E. from Adelaide; worked in 1864.

WHEAL VIRGIN.—Situated S.W. from Davenport Siding.

WHEAL WILLIAM.—Situated 10 miles E.S.E. from Keyneton.

WILLOW COPPER MINING SYNDICATE.—Six mineral blocks were held by this synidcate at Cradock, hundred of Yednalue.

WILLOW CREEK MINE.—Situated 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, *Catarpo, 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, * Moojoolee, 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.

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