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REPORT ON THE TIN FIELDS OF NORTH EASTERN TASMANIA

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1.

THE TIN FIELDS OF NORTH EASTERN TASMANIA

INTRODUCTION

The area under review in this report comprises the greater part of the north-eastern portion of Tasmania and includes the area in which tin mining is carried out to yield by far the greater part of the tin production of the State. As gold, the only other mineral economically produced, has a limited production, the area may rightly be referred to as the Tin Fields of North Eastern Tasmania. Tin production from the area has been continuous since the year 1875 but has fluctuated with demand and market price. Within the area are situated the principal alluvial tin mines of the State including the deep workings of the Briseis Mine where the total depth of the open cut workings approximates 500 feet.

OBJECT OF THE INVESTIGATION

Perhaps the earliest official report on the area was that of G. Thureau in 1884. In his report and accompanying map, Thureau has established the presence of and mapped some of the deep tin bearing leads of the district. Other investigators have since then extended the knowledge of the leads and have mapped many more of them. The conditions under which deposition has taken place has been established and the continuation of leads covered by Basaltic flows has been indicated.

It has therefore, been the object of this investigation to correlate the existing information and to extend the geological mapping to enable the leads to be mapped so that an estimate could be made of the future prospects of the Tin mining industry within the area.

SITUATION AND ACCESS

Generally the area examined may be referred to as the lands drained by the lower reaches of the Ringarooma and Mussel Roe Rivers and those lands drained by the Boobyalla River and its major tributary the Little Boobyalla river, and by virtue of a previous report the lands adjacent to the lower reaches of the Ansons River.

The area is well served with transport facilities for it is traversed by the North-eastern Railway from Launceston with its outer terminus at Herrick. The Tasman Highway parallels the Railway from Branxholm to Herrick from which point good to fair roads serve the area in the vicinity of Gladstone and Boobyalla. The Western section of the area is provided for by roads from the Highway between Branxholm to Herrick in a northerly direction through Winnaleah and beyond. All roads are generally serviceable in the summer months but in some cases the back roads become difficult in the wet season.

PREVIOUS LITERATURE

The earliest report on portion of the area under review was written as early as the year 1864. Since that date numerous reports have been written on portions of the area, individual mines or mineral deposits.

The following is a complete list of the Bibliography of the area: -

Published Reports

Part of the County of Dorset - Charles Gould, 1864
Goldfields of the Colony, - B.Shaw, 1881
Report on Gladstone, Mussel Roe and Waterhouse - G.Thureau F.G.S., 1881
Stanniferous Deposits at Ringarooma - G.Thureau G.F.S. 1884
Great Mussel Roe Water Scheme - G.J.Burke and G.Thureau, 1885
Select Committee on the Mt. Cameron Hydraulic Water Co's Water Race, 1885
Mt. Cameron Hydraulic Tin Mining Co. Race,G.J.Burke, 1886
General Geological Structure and Tin-bearing gravels of the Gladstone District - A.Montgomery,M.A. - 1891
Mt.Cameron Water Race - K.L.Rabbek, 1900
Tin-bearing Capabilities of the Gladstone District - W.H.Twelvetrees, 1901
The Gladstone Mineral District
Geological Survey Bulletin No.25-W.H.Twelvetrees, 1916.
The Sub-basaltic Tin Deposits of the Ringarooma Valley, Geological Survey Bulletin No.35 P.B.Nye M.Sc., B.M.E. 1924.
Mineral Industry of Tasmania, Quarter ending 31/3/13
Appendix 11. The Clarence Tin Prospecting Assoc. N.L.
New Banca Tin Mine
W.H.Twelvetrees.

Unpublished Reports

Cybele Tin Mine - Directors Report 18/7/06
Cybele Tin Mine - General Manager's Report 14/7/06
Proposed Deviation Mt. Cameron Water Race - L.Hills M.Sc. 28/7/21
Mineral Resources and Mineral Industries of North East District - P.B.Nye M.Sc., B.M.E. 4/4/26
Mt. Cameron Water Race and Alluvial Deposits North of Ringarooma River - J.B.Scott 31/8/26
Fly-by-Night Mine, Gladstone - P.B.Nye M.S.c., B.M.E.17/2/27
Garfield Mine, Methods of Operation -A.M.Reid 10/10/27
Auriferous Deposits in Tasmania - P.B.Nye M.S.C., B.M.E. 8/12/27
Garfield Tin Mine, Gladstone - J.B.Scott 15/3/28
Tin Deposits of Portion of Gladstone Mining Field - F.Blake 31/7/28
Some Tin Deposits in the Gladstone District - A.M.Reid, 30/10/28
Gladstone and Portland Gold Areas - J.B.Scott, 3/9/30
Proposed Restoration of Syphon at Site of old No.6 Syphon Mt.Cameron Water Race Gladstone P.B.Nye M.Sc. B.M.E. 4/7/32
Victory Gold Mining Company Gladstone-P.B.Nye M.Sc. B.M.E. 1932
Gladstone Gold Field - P.B.Nye, M.Sc., B.M.E. 21/1/33
Boring at Gladstone - Q.J.Henderson Jr., 1936
Boring at Mussel Roe - F.Blake 1/12/37
Tin-bearing Sites near GLadstone - H.G.Keid M.Sc. 15/2/45
Eddystone Quadrangle No.25 - H.G.Keid M.Sc. 30/9/46
Tin prospects of Blue Tier Quadrangle (33) - H.G.W.Keid M.Sc. 9/10/46
Portion of Gladstone Tin Field - H.G.W.Keid M.Sc. 21/10/47.

From the foregoing reports it has been gathered that as early as the year 1881 the Gladstone area was a tin field for Mr. G.Thureau in his "Report on Gladstone, Mussel Roe and Waterhouse" stated that" at present, fully two thirds of the stream tin works are idle owing to scarcity of water ....Last year there was shipped from the Port of Boobyalla alone about fifteen hundred tons of tin ore during a reasonably favourable season."

In 1884, the same writer with his report on "Stanniferous Deposits at Ringarooma" published a geological map on which he had indicated the probable directions of the Ringarooma, Cascade, and Main Creek deep leads.

In 1891, Mr. Montgomery M.A., in his "Report on the General Geological Structure and Tin-bearing Gravels of the Gladstone District"discusses the courses of the Mussel Roe Lead and suggests that this lead deviates from the course of the present river and suggests that its course more or less approximates that of the present Ringarooma River to the Aberfoyle Workings.

A later report by W.H.Twelvetrees in 1901 again refers to the Mussel Roe Lead. Twelvetrees recommended that some 50 or 60 bores be placed at selected sites to determine the nature of the lead and to confirm its position and direction.

In the year 1916, in Geological Survey Bulletin No.25 Twelvetrees discusses the Gladstone Mineral District and explains that the boring, recommended in 1901, was completed in 1902 and the results are recorded.

In 1925, P.B.Nye in his report on the Sub-Basaltic Tin Deposits of the Ringarooma Valley published as Geological Survey Bulletin No.35 mapped the area of the Ringarooma Valley extending from Ringarooma to Pioneer and has indicated the position and discussed the merits of all the known leads in the area.

It is, therefore, obvious that the principal tin-bearing leads have been known since the end of last century and that mining has been, for the most part, confined to those leads as being the most advantageous for economic operations.

GEOLOGY

The geological features of the district have been fully discussed by previous writers. It is, therefore, only necessary to here summarise the geological features.

Silurian. The oldest rocks of the area are a series of sandstone, slates and quartzites, lithologically similar to those of the Mathinna area. They occur as a comparatively narrow area trending north-easterly along a line a little to the north of the Ringarooma River extending from Branxholm to the flats to the north and north-east of Gladstone. For the most part this series has a superficial covering of recent sands and gravels and outcrops are scarce. Recordings of strike and dip were made chiefly from artificial exposures seen in road cuttings and mine workings. From such observations it was recorded that the strike of the series is generally a little west of north with variable dips.

Upper Palaeozoic. Granites have been extensively developed within the area examined. They are portion of the large granitic mass extending from Mt. Cameron, easterly to the coast, westerly to Branxholm and southerly to the Blue Tier and Goulds country. These granites have intruded the series of slates and quartzites and for this reason, failing more definite evidence have been assigned to the Upper Palaeozoic.

The granites vary considerably in texture from coarsely porphyritic to a comparatively fine-grained rock. The porphyritic varities show phenocrysts of orthoclase felspar ranging in length to three inches set in a ground mass, varying from fine grained to coarse, consisting essentially of quartz, orthoclase felspar, biotite and hornblende. In the Blue Tier area it has been established by Reid and confirmed by Thomas that the porphyritic granitic is, in general, not tin bearing - the fine grained granite being referred to as the tin granite.

In the marginal phase of the granite, more particularly in the vicinity of the slate contact, greisenisation with often the development of pegmatitic dykes have taken place. These disturbed areas are often productive of tin ore and where the disturbed conditions continue to depth the granite becomes readily weathered to render the tin ore recoverable by sluicing.

PERMIAN AND MESOZOIC

In the area recently examined there are no formations belonging to either the Permian or Mesozoic eras. To the east asmall occurrence of Permian strata is found at the northern end of Mussel Roe Bay and Mesozoic Dolerites are widespread to the east and north-east of the Township of Gladstone.

TERTIARY

Tertiary sediments are of widespread distribution in the north eastern tin fields and occur as extensive plains along the northern shore line of the State and as deep deposits along the course of the old stream channels.

It has been previously established; Gould, Montgomery, Twelvetrees, Nye; that deposition of the Tertiary Sediments was accompanied by the gradual subsidence of the land surfaces during which the old stream courses were infilled with the products of denudation to depths approximating 300 feet.

BASALT

Tertiary Basalt covers a considerable part of the area examined and occurs as a plateau of fairly even altitude trending in a north-eastely direction from Branxholm to Winnaleah.

The subsidence of the land surface terminated with the outpouring of the Basaltic lava which filled the old streams and covered large areas of the Tertiary sediments. Some of the Basalt has since been denuded by stream action but what remains served to indicate approximately the course of the original streams.

Since the Basaltic flows the land surface has been subjected again to a period of elevation which has resulted in a recession of the sea shore and the final elevation of the Tertiary sediments until their upper surface has in places reached altitudes approximating 500 feet.

ECONOMIC GEOLOGY

Only two minerals, Gold and Tin, have proved of economic importance in the area under review and production of Gold has for years been insignificant. The present investigation has been confined to those areas which are potentially tin bearing.

Tin ores occur both in the primary and in the secondary state.

As a primary ore, tin is a constituent of the many tin bearing Greisen veins which occur in the marginal phase of the granite, particularly in areas close to the granite-slate contact. Although the tin granite may contain a small proportion of tin as a constituent part, the source of the tin ore both primary and secondary, must be regarded as the greisen veins. These vary considerably in width although they seldom exceed two to three inches in width. The lateral extent of individual veins is not great but in favourable positions they are numerous and result in the formation of a zone of mineralisation.

There are few places where the primary ore is being won and even then the operators depend on the weathered condition of the granite to enable them to recover the ore by sluicing.

Tin in a secondary state is being won from the many open cut alluvial mines of the district. And to these most attention has been given.

It has been shown that the deposition of Tertiary sediments occurred during a period of subsidence of the land surface and that a considerable portion of the area has been covered by Basaltic lava flows which filled the stream courses and depressions then existing. With the consolidation of the lava the course of various streams was altered. In many cases the new streams have followed the edge of the basalts but in some the streams have cut their bed in the basalt itself to reveal the underlying tertiary sediments. It is apparent also that the subsidence of the land surface terminated at approximately the time of the outpouring of the lavas and that elevation of the land has since been in progress.

During the elevation of the land, in late Tertiary times, the coast line gradually receded; and as a result of denudation and redistribution of early Tertiary sediments, extensive coastal flats were formed. With a recession of the sea a succession of coastal terraces was formed on which was left the residuals of the early Tertiary sediments. It is expected, therefore, that in the wash of these terraces some high grade ore, comparable to that of the deep leads, may be found, but in the flats it must be expected that the general grade of ore will be lower than that in the more confined deep leads although some later channels cut and refilled in the original sediments may approximate in grade the ore of the deep leads.

THE KNOWN LEADS

As early as the year 1885 Thureau indicated on his map the course of the deep leads that were then known. Hid direction for the Ringarooma, Cascade, and Main creek leads were determined accurately except that it is now considered that the Ringarooma leads takes a more northerly direction from Derby.

In the year 1891 Montgomery discussed the general direction of the Mussel Roe Lead in the vicinity of Gladstone and indicated its possible course in the vicinity of the township.

In 1901 W.H.Twelvetrees again gave consideration to the direction of the Mussel Roe deep lead and suggested that some boring be done to confirm his opinion.

The boring was done in the year 1902 and in 1916 Twelvetrees again reported on the area.

In 1925 Nye again discussed and mapped the various leads between Branxholm and Pioneer and indicated the corrected position of the Ringarooma Lead and its probable junction with the Cascade, Main Creek, Weld, O.K., Gladstone and Wyniford Leads. The latter lead was the scene of operations of the Pioneer Tin Company.

The operations of the Endurance Tin Mining Company have confirmed the presence of the Endurance Lead as trending westerly along the southerly foothills of the Mount Cameron Peaks. Boring by the company has proved a continuation of the lead to the west of the position of their present operations and its continuation still further westerly may be assumed.

There can be little doubt that the main Ringarooma Lead turned in a northerly direction at or near Derby and its continuation should occur at or a little to the east of Winnaleah to continue further north and trend with the present course of the Little Boobyalla River. Along the course of the Little Boobyalla mining operations have been carried on for a considerable period but it is evident that the greater part of the lead has been removed by recent denudation and only remnants of the deposit remain. From these remnants some high grade ore has been won but operations have generally been only on a small scale.

THE DORSET TIN DREDGE

The Dorset Tin Dredge is operating on the Dorset Flats located on the Ringarooma River in the vicinity of its junction with Corduroy Creek and about three miles to the north of Pioneer along the main road to Gladstone. An area of 604 acres of which 12 acres are residential sites, is held as leaseholds by the Department of Supply and Shipping which is responsible for the operation of the dredge.

Previous to the construction of the present dredge several attempts were made to exploit the area.

In the year 1907, the Ringarooma Bucket Dredging Company commenced operations and in three years produced 114.2 tons of tin oxides and 209.40 ozs. of gold.

In 1906, the Dorset Bucket Dredging Company was formed and after completing a boring campaign commenced operations in ground of an average depth of 16 feet and of a reputed grade of 1.19 lbs. p.c.y. In four years, 1907 - 1910 inclusive, this company produced approximately 150 tons of tin oxide and 170 ozs. gold.

In 1910 the Dorset Bucket Dredging Company was re-organised as the South Mount Cameron Tin Dredging Company and the plant was altered and reparied. The Company apparently ceased operations in the year 1912 after production of 6.4 tons of tin oxide and 11.25 oz. gold.

There were no further developments on the area until it was again taken up by the Department of Supply and Shipping in the year 1943 when construction of the present dredges was commenced.

The present dredge is a modern one manufactured by Payne & Co. of England. It is electrically driven by power supplied by the Hydro Electric Commission of Tasmania. The bucket ladder is close coupled capable of digging to a depth of 50 feet and the dredge has a reputed capacity of 150,000 cubic yards per month. The material dredged is classified by revolving trommel into sizes suitable for treatment by batteries of jigs by which means the tin ore is recovered, the tailings being returned to the paddock by launders over the stern of the dredge.

Construction of the Dredge was completed towards the end of 1944 and the first record of production shows that in 1944 a recovery was made of 3.979 tons of tin oxide from the treatment of 174,000 cubic yards of alluvium, an average of .051 lbs. p.c.y. The first complete year of operating showed a recovery of .19 lb. p.c.y. from the treatment of 1,590,000 cubic yards to yield 135.5396 tons of concentrate. Throughout its life the highest recovery recorded is one of .262 lbs. p.c.y. in 1948 when 1,662,000 yards were treated for the recovery of 196.00 tons of concentrates.

The Dredge has been the principal producer of tin ore in the North East of Tasmania and during its nine years of operations has produced 1041.5 tons of concentrate containing 766.513 tons of metallic tin valued at £465,071.97 together with gold, recovered from the concentrates, of total of 2,922.896 fine oz. valued at £29,433.36.

The future life of the Dredge on its present location is estimated at 10 years.

SOME WORKING MINES

The Briseis Mine.

The main Briseis Mine is situated on the North Bank of the Ringarooma River at Derby. The leases held by the present company cover an area of 203 acres as compared with 572 acres as held by the original company. The leases extend in a southerly direction for some distance up the Cascade River. The main workings of the original company consist of an extensiive open cut of a total depth of approximately 500 feet of which 200 feet is composed of Basaltic overburden. For the most part the Basalts are well weathered but in the deeper sections it is in a fresh condition and is difficult to remove. The drifts in the deep face approximate 300 feet in depth and are, in general fine grained sands and gravels with bands of coarser material occurring in them.

Present operations are being carried out to the south of the Ringarooma River and main road in the Cascade River. From the roadway upstream for some distance an area of Shingle ground occurred bu t the present face is free of shingle.

Originally there were a number of mines operating on the Cascade lead but these were gradually absorbed by the Briseis mine. At present the working face is approximately 30 feet in depth and shows an appreciable depth of tailings covering the wash left by previous workers. Shortage of water prevented the original operators from elevating their wash and the deeper ground was in many cases left untreated. It is this ground that is at present being worked by the Company.

The water supply is derived from the upper sections of the Cascade River and Main creek and is delivered to the mine with a head pressure of 320 feet. These water rights belonged to the original Company which had, in addition, water rights in the Ringarooma River and Maurice River. From these latter sources water was delivered distances of 20 and 30 miles respectively, to the working face where the head pressure was 420 feet.

From the Cascade sources the company has sufficient water over the greater part of the year for their present operations and the Ringarooma River water is supplied to the Ormuz Mine.

Figures recording the production of the Briseis Mine are not complete but they do show that the mine has produced at least 13,500 tons of tin of a total value of £2,700,000 approximately.

THE PIONEER MINE

The Pioneer mine, now closed down, is perhaps the oldest mine in the district. Mr. G. Thureau, in his report on the Stanniferous Deposits at Ringarooma written in 1881, mentions the area extending from Ruby Flats to the Pioneer Tin Mining Company's workings.

P.B.Nye in his report on the Sub-Basaltic Tin Deposits of the Ringarooma Valley has recorded that tin was first discovered by Wm. Bradshaw, who applied for a lease in 1877, and the Pioneer Tin Company was formed in 1882. Re-organisation of the company took place in 1900 and Nye in 1925 stated "sluicing commenced the same year, and operations have been carried out very successfully and continuously up till the present time."

Operations were continued till the year 1933 when the Company was absorbed by the Endurance Company.

During the last two years of operations the Company won approximately 80 tons of tin from re-treatment. Official figures of production are far from complete but they record that from 1900 to 1933 at least 14 million cubic yards of drifts had been treated for a recovery of at least 9,100 tons of tin. No estimate of total value is available but one record shows that in 1926 an amount of £512,129 had been distributed as dividends.

It is also on record that as the lead was tested in a westerly direction the grade became lower for the bottom was falling and the surface was rising.

The surface continues to rise in a westerly direction. It is , therefore, to be expected that the grade will continue to fall unless the continuation of the lead on the fall to the Little Boobyalla River can be determined by boring. With the loss of overburden the grade may then be economical.

THE ENDURANCE COMPANY

The Endurance Company is one of the principal producers of tin in the area and has an annual output of approximately fifty tons per year. The Company is operating on land situated in the vicinity of the township of South Mount Cameron at the foothills of Mount Cameron itself and is the holder of approximately 750 acres as mineral leases, together with water rights totalling 156 sluice heads, 125 acres as tailings areas, 96 acres as machinery and pumping station areas and 238 acres as dam sites.

The Company was formed in 1922 to take over the holdings of the Endurance Tin Syndicate and commenced operations on leases about one mile north of the township of South Mount Cameron between Bradshaw's Creek and Gladstone. The ground varied in depth to 100 feet. Steam power was used to drive Gravel and Water pumps mounted to a wooden barge. In 1928 the power units were augmented by the installation of a Deisel Engine but the mine soon closed down and for some years the only operations were those of tributors.

In the year 1933 when the Pioneer Tin Company ceased operations, its assets were acquired by the Endurance Company and their workings were equipped with electrically driven Gravel and Water pumps. The equipment was still mounted on a Wooden barge. The power was generated at the ex Pioneer Company's 1,300 H.P. hydro-electric power station situated on the Frome River near Moorina, a distance of about eight miles from the mine. Water for sluicing operations was obtained from the Ringarooma River and a pumping station, electrically driven, was erected on the river bank and commissioned in 1935. The water is delivered a distance of approximately a mile to the working face, the quantity delivered being about 42 sluice heads.

The early operations of the Company were unprofitable and a boring campaign was carried out to determine the higher grade portions of the lead. The boring showed that the lead varied in grade, depth and width and that the mid section of the lead for a distance of approximately half a mile was narrow and too low in grade to be payable. It showed also that the lead extended westerly beyond the scene of present operations.

The Company commenced operations in the higher or eastern end of the lead but in 1945 the western section was opened up and sluicing operations commenced at Clifton Creek.

The grade of ore treated was not low for official figures show that for the period 1935 to 1946 the quantity treated was 3,926,000 cubic yards for a recovery of 1,311 tons of concentrate, an average grade of 0.75 lbs. p.c.y. This grade has been fairly well maintained since 1946 although a lower grade was treated over the years 1949 and 1951.

It is to be expected that future operations will be towards the development of the western extension of the lead towards the Little Boobyalla River but bore results suggest a falling off in grade in this direction.

THE BANCA MINE

The Banca Mine is situated on Simpson's creek, a tributary of the Boobyalla River, about nine miles north from the township of Winnaleah. The present proprietor, Mr.R.L.Rainbow, is the holder of 39 acres held as mineral leases and Dam sites totalling 35 acres. Water rights for a total of 13 sluice heads are also held.

The original lease of 30 acres in the Banca area was taken up in the year 1934 by Mr. M.F.McDougall. In 1935 the lease was transferred to Messrs.P.B.Dutton and R.L.Rainbow and in 1940 was transferred to P.B.Dutton. In 1947 on his return from Active Service, Mr.R.L.Rainbow purchased the property and has been operating there ever since.

Records show that to the year 1941 a total yardage of 44,350 was treated for the recovery of 19.873 tons of concentrate containing 14.230 tons of metallic tin valued at £10,662. Between 1941 and 1947 production was not continuous and was valued at less than £1,000 whilst the recovery between 1947 and 1951 was 15.829 tons of concentrate containing 12.771 tons of metallic tin valued at £9,593.

A considerable area has been worked in the vicinity of Simpson's creek and it and its tributaries have been worked from the junction with the Boobyalla for upwards of a mile upstream.

Mr. Rainbow makes a rule of testing his ground ahead of the workings and for this purpose uses either a small post hole digger or an Auger. He is satisfied that a considerable area of land of an economic grade is available.

An examination of the working face shows that the drift contains a fairly high proportion of clayey material but responds readily to treatment with the nozzle. Seams of coarse wash are visible in the drift which appears to carry some tin throughout for the present workings are not being bottomed.

It is the proprietor's intention, at a later date and with an improved water supply, to elevate the drift at present left untreated. The daily throughput is approximately 50 cubic yards and the yarly recovery is in excess of three tons of tin concentrate.

In the year 1940 some boring was done under the supervision of the Department of Mines in the vicinity of Banca workings on the flat through which Simpson's Creek and the Boobyalla River flow. To the east of the river the boring proved deep ground which was becoming deeper towards the east. Some of the bores proved high grade drift and some of the bores failed to reach bottom. The possibility of deep ground containing high grade wash should not be overlooked.

THE STAR HILL MINE

In the Gladstone district the most important operator is the Star Hill Syndicate which holds, in the name of the manager, Mr. H. C. Lawry, a total of 113 acres as mining leases and is an applicant for a further 35 acres. Several water rights are also held although the water being used is at present drawn from the Mount Cameron Water Race Board.

The Syndicate originally worked the Star Hill area, from which it took its name, situated about one and a half miles south from Gladstone along the GLadstone-Pioneer road. Operations were commenced in 1935 using water from the Mount Cameron Race which was pumped to the working face by steam power, the pump being designed to deliver 900 gallons of water per minute, six sluice heads, against a head of 200 feet. The pipe column of 11 inch pipes had a maximum length of 4,000 feet whilst the working face was 130 feet above the water supply. Operations were continued at the Star Hill till the year 1939. During this period of operations tin ore to the value of more than £7,000 was won and work ceased only when the available power was insufficient to deliver the water at a reasonable working pressure.

The formationb eing worked consisted in part of alluvial drift and gravel and in part the weathered surface of pegmatitic granite in which numerous tin-bearing veins occurred. It is considered by the manager that the grade of ore remaining is sufficient to warrant its exploitation provided an assured supply of water was available. With Hydro-Electric power now available it is suggested that water could be taken from the Ringarooma River and pumped against a head of 300 feet to economically work the remaining ground.

In the year 1939 the steam plant was moved to the site of the present pumping station on machinery site 4W/39, the site of the Syndicate's Dam. This is situated near the head of Tamar Creek and to the east of the Ringarooma River.

For several years operations were continued with the steam plant as the source of power, and a large area was treated in the vicinity of and south easterly along Harden's Ravine.

The ground being treated here was similar to that at Star Hill in being partly alluvium and partly the pegmatitic tin bearing veins in the weathered granite. The high working costs of the stea m plant rendered profits uneconomic and a change was made to Electric Power supplied by the Hydro Electric Commission.

Two 125 B.H.P. electric motors coupled to 7 to 8 inch Thompson's pumps were installed at the Dam site. Each pump is capable of delivering 1,250 gallons of water per minute against a head of 250 feet. One of these units is used to pump water direct to the working face whilst the second unit is used to pump water to a high level dam 130 feet above the level of the pump. From here a 100 B.H.P. electric motor direct coupled to a 9 to 10 inch Thompson's pump is used to give 150 feet of pressure at the working face.

Tin to the value of £66,000 has been won from this site.

It is of interest to note that in the year 1906 Mr. A.E.Thomas A.M.I.C.E. general manager of Cybele Tin Mining Co. recommended to his company's directors that a power unit of 1200 H.P. be installed on the bank of the Ringarooma River to pump 45 sluice heads of water through two 20 inch rising mains a height of 330 feet to give pressure to giant nozzles on the hill.

The area held by the present Star Hill Syndicate more or less covers the area held originally by the Cybele and the Garfield Companies, the latter company having failed because water was delivered to their working faces at too low a pressure and in insufficient quantity to give a profitable yield.

PARK, GROVES & RICHARDSON

The Park, Groves & Richardson party are operating on leases situated on the western banks of the Mussel Roe River about three quarters of a mile south from the Gladstone - Anson Bay road. The area held as mineral leases covers 30 acres and water rights for 20 sluice heads are also held.

The party is operating with water drawn from the Mussel Roe River and is delivered to the working face by a D.N.X. 6 cylinder Hercules Deisel engine, capable of delivering 300 H.P. operating an 8 inch pump to deliver 12 sluice heads of water. At the working face a 6 cylinder Hercules Diesel engine capable of delivering 90 H.P. is used to drive an 8 inch gravel pump.

The mine is situated at the northern end of an area, adjacent to the river, which was selected in the year 1945 to be tested by boring. Some boring was carried out during April and May of 1946 on the southern end of this area to show the presence of a narrow lead of tin bearing drifts which revealed an average depth of 27 feet and an average grade of 7 oz. p.c.y.

The party is operating on a fiarly extensive low lying flat only a few feet above the level of the river. The first site selected for operations was abandoned partly due to flooding and partly due to the low grade of ore treated. At the second site a higher grade of ore was won.

In the first two runs at the first site a total of 29 bags of ore was won whilst at the second site the first clean up yielded 22 bags of concentrates.

AMBER HILL MINE

The present holdings at the Amber Hill mine cover an area of 53 acres held as a consolidated lease in the name of J.T.Shields.
Originally this lease was held by M. J. Groves as a series of small leases adjoining each other and were consolidated by Groves in the year 1917 and remained in force till the year 1935. During that period considerable work was carried out with a limited supply of water obtained from the head of Amber Creek where a Dam site of one acre was held. The pressure at which the water was used at the face was low and generally was only the equivalent of the height of the working face, from 50 to 70 feet. The section of the working face reveals a fair proportion of clayey material and near the bottom a band of cemented wash both of which were difficult to treat with low pressure water. Dry weather in the years immediately prior to 1935 made profitable operation impossible and the leases were forfeited in 1935 when Mr. J.T.Shield became the new Lessee.

In the year 1937, by arrangement with the Department of Mines, some boring was done on the Amber Hill lease when 53 bores of a total footage of 3,155 feet were completed.

The records of this boring showed that a channel, Lead, existed on the lease, in which high grade tin ore occurred, at depths ranging to 73 feet below the surface.

The mine was idle until in 1949 it was revived and equipped with a DNX Hercules Deisel engine of six cylinders used to operate an 8-inch pressure pump to deliver water to the working face at a pressure of approximately 75 lbs. to the square inch. Water was supplied by the Mt. Cameron Water Race Board and was delivered by water race to a dam situated at an altitude of about 50 feet below the bottom of the working face and some eight hundred feet distant therefrom.

Production commenced in 1950 and in the period 1950-52 operations were responsible for the production of 14.140 tons of tin concentrates, valued at £8,455.

Operations were discontinued in July 1952 when the lead narrowed to such an extent that the proportion of overburden to be removed to ensure safety became too great for economic mining. The workings did, however, confirm the presence of the lead suggested on the bore plan and confirmed also its direction as being south-easterly.

Though production figures are incomplete, several quarterly returns show both the yardage treated and the concentrates recovered. These show that in June 1951, a recovery of 0.71 lb. p.c.y. was made but generally the recovery ranged from 0.47 to 0.43 lb. p.c.y., which is approximately half the grade suggested by the bore plan.

North of the Amber Hills workings and parallel to the road to Gladstone a second series of workings occur. These workings suggest the existence of a second tin-bearing lead which lies more or less parallel to the Amber Hill lead. To the south east of this position work by Mr. Standage failed to confirm a continuation of the leads in that direction and to the West of Amber Hill the workings of Peacock Creek suggest that the lead terminated before reaching the vicinity of the Ringarooma River.

FUTURE OF THE INDUSTRY

The foregoing references to the working mines of the district are far from complete but they serve to give some of the history of the mining development there. Recorded figures reveal that the annual output of tin ore from the north-east is of the order of 350 tons which compares unfavourably with the figure quoted by Mr. G.Thureau in 1881 when he referred to the fact that fully two-thirds of the tin works were idle due to shortage of water, but in the year previous 1,500 tons of tin ore were shipped from the port of Boobyalla. It is to be expected that after a period of 70 years of operations some falling off in production, particularly where the product is derived from alluvial deposits, must take place but even in those times the fields were troubled with water shortage. Progressive elements even then were advocating the installation of pumping plants to deliver water to the higher lands to overcome water shortage and prevent loss of operating time. It is worthy of note that at least as far as the Gladstone field is concerned the entire product, with one minor exception, results from mines operating with water delivered to the working faces at pressure augmented by mechanical means, either of Deisel engine or Electrical power. Although most of the mines are dependent on water from the Mount Cameron Water Race, one at least is operating with water drawn direct from the Mussel Roe River and pumped at pressure to the mine.

As the greater part of the land, capable of being worked by water under gravity from the present sources, has been exhausted, the possibility of pumping water direct from independent sources must be considered in any future mining operations of the district for even those mines which at present can operate with a gravity fed supply seldom are able to maintain full production during the dry weather months of the year.

Future production in the field will depend on the development of -

(1) The remnants of known leads,
(2) Areas of Terraced lands, and
(3) Broad flats of re-distributed Tertiary gravels.

(1) Remnants of the known leads.

Most of the present mining operations are directed towards the recovery of ore from the remnants of known leads and possibilities exist for expansion in that direction. The principal operators are the Endurance Company, the Briseis Company and the Ormuz Mine, which are working the Endurance, the Cascade and the Arba leads respectively. Operations on a smaller scale are being carried out near Pioneer on the Wyniford lead by Messrs. Wood and Slatter and on the Weld lead by Mr.Boon. In the two latter cases small remnants of high-grade ore are being treated.

With the principal operators, though re-organisation of the companies has taken place, their mining operations have been more or less continuous with the Briseis and the Ormuz being fortunate in having a water supply under gravity sufficient to maintain operations for most of the year. The Endurance Company pumps their water to the working face with electric power generated at their power station on the Frome River.

(2) Areas of Terraced Lands

Terraces left after the action of the sea on the Tertiary deposits during the period of Tertiary elevation are of two types.

(a) Narrow terraces of undisturbed sediments, and
(b) Marine terraces formed by wave action on the foreshores.

(a) Narrow terraces of undisturbed sediments have been left in a number of places, particularly on the northern slopes of Mount Cameron. In this locality there are a number of comparatively small areas of shallow ground trending more or less parallel with the mountain although extensions northward may occur. The ground is generally shallow and the deposits are irregular in that they are not continuous occurring as isolated areas of limited extent. The bottom is uneven and in parts the northern extensions adopt the characters of a lead in that they are the remnants of infilled gullies, the further extensions of which have been denuded.

(b) Marine Terraces formed by wave action on the foreshore are characterised by the occurrence of shingle beds. Some of these terraces are fairly extensive and represent the accumulated Talus left on the receding coastline as the land was elevated. With the Shingle some of the earlier tertiary sediments have been re-deposited. The grade of ore won from these terraces is variable and is, in general, lower than in the main leads but profitable operations are at times possible. To a great extent the area being treated by the Dorset Dredge is such a terrace and at Swain's workings, upstream from the dredge, a good example of such a terrace is visible.

Twelvetrees records the occurrence of similar shingle at the Edina Mine whilst similar shingle has been seen at the Black Duck, Dobson's Delta and on the west bank of the Boobyalla River about one and a half miles from its outlet. The latter area occurs on an extensive flat area extending upstream along the river for a distance of perhaps two miles.

FUTURE MINING OPERATIONS

While it is to be expected that the present operators in the district will be able to maintain, more or less, their present rate of production over a further period of years, future mining operations must depend on the finding and development of new areas of undeveloped lands. Some of this land will be located close to those areas on which present operations are being carried out but for future success in the industry new areas must be tested.

In the report on the Eddystone Quadrangle, an area in the vicinity of the Mussell Roe River was selected as a potential tin-bearing area. It extends southwards along the river from the Gladstone-Anson Bay road for a distance of approximately two miles. Some boring was done in 1946 by the Department of Mines on the southern end of the area.

The results confirmed the presence of a narrow tin-bearing lead trending in a north-north-westerly direction. The whole of the area was not tested but recently a section of the flat situated within half a mile of the road has been opened up and profitably mined by Messrs. Park, Groves and Richardson.

In the report on the Blue Tier Quadrangle an area was referred to as potentially tin-bearing. The area is about three square miles in extent and is situated near the Great Fraser Rivulet at the point where the Gladstone Gould's Country road crosses the Rivulet. This area has not yet been tested.

From the present examination it is considered that in the vicinity of the Banca Mine there occurs an extensive flat, extending more or less from the Boobyalla River easterly to the Little Boobyalla River, which is potentially tin-bearing. Some of the low ridges of the area are Basalt capped but the greater part of the area has no Basalt and the area should lend itself to testing by boring.

Some boring has already been done on the western side of the flat by both the Department of Mines and by the Endurance Company. This boring has shown that tin ore does occur in deep ground near the eastern boundary of the Banca holdings. It is to be expected that further boring will disclose additional reserves.

Along the Little Boobyalla River on the back road from Herrick to Boobyalla at a distance of about seven miles from Herrick, a broad flat occurs which extends from the road westerly to cross the river. The flat extends for at least a mile and a half along the river and is advantageously situated to contain tin ore.

From time to time many leases have been held along the Little Boobyalla River and small workings are common. One operator is at present working his show near the head of the river and Hastie's workings have been in operation during the wet season for a number of years. Mr.P.V.Cross also has a holding at the intersection of Walpole Creek with the river and prospecting along the river may be profitable although operations will be limited to the wet season.

Within a mile and a half of the mouth of the Boobyalla River and extending southerly along the river there is an extensive flat. Some mining has been carried out to reveal an area of shingle which was proved at one point to be 25 feet in depth. The grade of ore has not been accurately determined but it is considered of medium grade by the Operators. The flat is a continuation of the one on the east side of the river on which Dobson's Delta Mine is situated. At Dobson's Mine shingle of high grade has been worked and it is to be expected that at least some parts of the continuation of the flat will contain ore of a comparable grade. The tailings at the Delta Mine are considered high grade and local reports assert that re-treatment of the tailings has on occasions proved profitable.

From Mount Cameron northerly towards the Ringarooma River and beyond there is an extensive area of flat country. The workings of the Native Lass, Echo and Vulcan mines, together with the number of small workings closer to the mountain show that the area is in part tin-bearing. Some boring has been carried out on the northern side of the river but it is considered that further boring would reveal additional reserves of tin.

In all instances consideration must be given to the provision of an adequate water supply. As a general rule it would be futile to depend on storage of water as the cost of construction of dams would be prohibitive and in fewplaces only would the catchment warrant the expenditure. With the existing water supplies the limit of usefulness has been reached for the existing mines are using the full output of the present races. For future mining, therefore, the water supplies must come from the existing streams and mining operations be confined within the area where it is economically possible to deliver water by pumping plant.

GEOLOGICAL MAP

A geologcial sketch map of the area examined has been prepared. It is based on the Aerial Photographs of the area and various land and mineral charts of the district. Use has been made of maps already published and alterations and additions have been made where necessary.

In some parts of the area where workings have been made the formations have been recorded as Tertiary sands and gravels although sluicing operations have removed the greater part of the tertiary alluvials to expose the underlying formations either granite or slate. The areas are, therefore, composed essentially of granite or slate but the remnants of the tertiary sediments may be tin bearing and have therefore been recorded as tertiary. In some of the areas recorded as slate some surface alluvials may occur but slate outcrops on ridges and in the deeper gullies suggest that at shallow depths the alluvium would yield to slates and so the areas have been mapped as slate areas.

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23rd December, 1952.