THE MINERAL RESOURCES and the MINING INDUSTRY of the NORTH EASTERN DISTRICTS in RELATION to the POSSIBLE PROVISION OF HYDRO-ELECTRIC POWER.

Introduction

During 1924, a request was made by people interested in tin mining in the north-eastern districts for the transmission of hydro-electric power to these districts for use in connection with the mining industry. The Hydro-Electric Department arranged for an inspection of the mines of the district and this was carried out by Messrs. J.O. Hudson , Chief Inspector of Mines and C. Curtain who reported on them in April, 1924. Later an examination was made by the Hydro-Electric Department.

Recently the Ringarooma Municipal Council requested that a geological inspection and report be made with the object of further consideration being given to the transmission of hydro-electric power to the north-eastern district.

General Statement

In considering the question of the extension of the hydro-electric power to a district, it is obvious that there must exist a substantial demand for the power to make the enterprise a successful one. In the north-eastern district power could be used for the following purposes among others:-

(a) Townships - domestic lighting and power, street lighting, water supply, etc.

(b) Farms - domestic lighting and power, small power plants for pumping, harvesting, separating, etc.

(c) Factories - Butter factories etc.

(d) Saw mills.

(e) Mining Industry.

Of these, the mining industry would be by far the largest potential user of power and the advisability of the transmission of power to the district therefore depends upon the mining industry and its future. The mining industry in its turn depends upon the mineral resources of the district and their exploitation. The mineral resources can be determined with a fair degree of accuracy, but their exploitation is much more uncertain, as it depends upon many factors, including:-

(1) Nature of the deposits.

(2) Value of the ore.

(3) Value of products obtained.

(4) Cost of working.

The mineral resources and their exploitation thus have a most important bearing on the question, and so will be fully discussed below.

Mineral Resources

The only ores which have been exploited within the district are those of tin and gold and of these the former is by far the more important. The total production of tin ore amounts to approximately £7,000,000 while that of gold is relatively small.

(a) Gold

The chief goldfield is that of Alberton. Numerous mines have been operated in the past but with indifferent results. The field contains short and narrow quartz veins with irregular shoots of gold. The only mine engaged at present in actual mining and milling operations is the Ringarooma United. This mine is equipped with a 10 battery of 700 lb. stamps, two amalgamating plates, four concentrating tables etc., the power being generated by a 40 H.P. Crossley oil engine.

Underground work is also being carried on at the Mt. Victoria mine and on the South Star reef, while the alluvial ground is being tested by Messrs. Fowler and party. The latter mine is equipped with a 6½ H.P. oil engine.

(b) Tin

Tin occurs throughout the district as:-

(1) Secondary deposits including detrital and alluvial deposits, the latter ranging in age from Recent to Lower Tertiary.

(2) Primary deposits including greisen lodes, quartz lodes, greisenised granite, and altered granite formations of various types.

It is from these primary deposits that the tin ore of the secondary deposits has been shed. The primary deposits are restricted with one or two unimportant exceptions to the granite which occurs so plentifully in the north-eastern districts.

(1) SECONDARY DEPOSITS

The most important of these are the Tertiary system of deep leads of the Ringarooma River. These leads are buried beneath a thickness of Tertiary drift and basalt. All the workings so far have been on tributary leads and the Ringarooma lead has not been touched. This system of leads has provided the largest mines of the district viz Briseis, Pioneer, Arba and Echo.

The Great Mussel Roe River has also formed a system of deep leads, but not of such importance as the Ringarooma River system. The leads cannot be so definitely traced and they appear to make into an extensive area of deep ground with ill-defined gutters. This is due probably to their entry into the sea or an estuary in which the concentration of tin ore has not been so effective as in the stream valleys. Moreover, the supply of tin ore from primary deposits, of which few are known to exist, has not been so great in the Mussel Roe system.

Next in importance are the deposits of medium depth ranging in age from Lower Tertiary to Recent at numerous localities throughout the district e.g. South Mount Cameron Wyniford River, Ruby Flat, etc.

The remaining type is the shallow deposits of detrital and alluvial material which follow the present surface and small creeks and gullies thereon.

A description of the principal alluvial mines is given below.

RINGAROOMA SYSTEM OF DEEP LEADS

Branxholm Creek Lead - The upper part of this lead was worked in the Arba mine, but operations ceased in 1920. The lead continues through private property and leases owned by F.W. Edwards for a length of 40 to 60 chains. The material treated in the past averaged approx. 1 lb. per cu. yd. During the past three years tributors have won 60 tons of ore from the tailings, so it is apparent that an appreciable amount of ore was lost and that the material must be higher in value than the recoveries indicated. The depth of the face was 167 feet and it is probable that a face of 200 feet would have to be worked for 20 chains when it would gradually decrease to 100 feet.

Water-rights consist of 52 S.H. which to the bottom of the workings would probably have pressures of 200 feet. This supply does not represent sufficient power to work this mine if it should be restarted at any time and it is probable that approx. 500 to 700 H.P. would be required. The approx. total production has been 1900 tons of ore and £27,000 paid in dividends.

Valley Creek Lead - This lead was worked by the Ringarooma Valley and Briseis Extended Companies and is at present held by the Briseis Central Co. About 1750 feet of the lead is held and probably portion of the Ringarooma lead. The depth would range from 60 to 150 feet. The value of the ground appears from boring and past working to be between 0.5 and 1.2 lbs. per cu. yd.

Water-rights consist of 44 S.H. which could be delivered to the mine with a pressure of 500 feet. It is probable that additional power of say 200 to 300 H.P. would be required to work the mine efficiently.

Cascade Lead - This lead is being worked by the Briseis Co. It continues beyond the Company's lease through private property (of which the Company holds the mining rights) to join the Ringarooma lead about 60 to 80 chains NW of the present face. The bottom is 150 feet below river-level and the face is 400 to 500 feet high. The average value of the drifts being treated is 1½ to 2 lbs. per cu. yd., the upper drifts being practically valueless and the bottom drifts being very rich. In addition to these upper drifts, at least 100 feet of basalt overburden has to be removed and this will eventually attain a height of 200 feet.

The water-rights consist of 110 S.H. from the Cascade River 132 S.H. from the Ringarooma and Maurice Rivers, and 36 S.H. from Main Creek. The former supply is delivered to the mine with a pressure of 320 feet and in conjunction with a dam will yield 60 to 70 S.H. for six months and 30 S.H. for six months in a dry summer. This supply is used for removing overburden. The Ringarooma River supply is delivered with a pressure 420 feet and represents a power supply of 800 H.P. assuming the efficiency is 75%. It is used for sluicing the wash and drifts elevating the tailings and pumping the sluicing water up to river level.

Although possessing nearly all the water and power it requires, this mine ould probably make use of electric power for the following:-

(1) Belt conveyor.
(2) Small water pumps in connection with the drainage
(3) One gravel pump in bottom of workings.

This would represent a maximum demand of 400 H.P. and it would be taken from time to time in portions of 100 H.P.

A supply of power of about 200 H.P. for the summer would also be welcomed if it could be obtained on a monthly maximum demand basis.

The present output is 200 to 300 tons of tin ore valued at £35,000 to £50,000 per annum. The total amount to date from this lead is 22,481 tons, of which the present Company has produced 12,881 tons valued at £1,644,900 and paid £502,500 in dividends.

Main Creek Lead - The upper part of this lead on the eastern side of the Ringarooma has been worked by numerous companies in the past with indifferent results due to the fact that only small portions of the lead had escaped denudation.

The continuation of the lead on the western bank of the river continues in a general NW direction beneath private property for 1½ to 2 miles to join the Ringarooma lead. The first 5 to 7 chains is devoid of basalt cover, but the remaining length is under basalt cover, and the mining thereof represents a large undertaking similar to the Briseis mine.

Messrs. P.W. Edwards and Lester are mining the lead at present in the old Lone Brother mine. Only the lower drifts are being treated at present, but upper drifts will gradually become a part of the face and in a distance of 5 to 6 chains, basalt overburden will be encountered.

The water-rights held consist of 6 S.H. from Krushka Creek which is delivered to the mine with a pressure of 200 feet. This supply is a small one and not constant in dry weather. Work can be carried on with it for a time but as the bottom is falling ahead, and elevating will be necessary, the above supply would be totally inadequate.

If the mine is operated on a large scale, a much greater supply would be necessary and could be readily obtained from the Ringarooma River. Electric power to the amount of 250 to 400 H.P. could be utilised for:-

(1) Pumping the water and giving it a pressure of 200 ft. for sluicing with nozzles.

(2) Gravel pump to elevate the material and sluicing water.

Later as the basaltic overburden had to be removed further power to the extent of 300-500 H.P. would probably be necessary for this purpose.

To enable such workings to be carried out a company with adequate capital would have to be formed. During the last four weeks workings, 3.45 tons of ore were produced with a good profit.

Weld Lead - This lead is being worked at its southern end in the Echo mine. This mine was formerly operated by individuals, but since July of this year, the Moorina T.M. Co. N.L. with a capital of £6,500. A bed of wash on a false bottom is being worked at present and the greatest height of the present face is 40 feet. The gutter of the lead appears to have been worked in only

one place. The lead continues to the N for a distance of two miles and has basaltic overburden over only a small portion of its length.

The approximate production in the past has been 265 tons of ore. Water-rights are held for 44 s.h. and 30 s.h. can be delivered with a pressure of 270 feet at the face.

Additional power is not required at present, but as work progresses to the N, the material will have to be elevated and a gravel pump will probably be used absorbing 100 to 200 H.P.

Wyniford Lead - This lead has been worked by the Pioneer Company since 1900 during which time it has treated 13,000,000 cub. yds. for 8607 tons of tin ore and paid £512,129 in dividends. The greatest width of lead worked is 1200 feet and the depth of the present face is 70 to 90 feet. The values appear to have steadily decreased as work has progressed down the lead until at present they average 1 lb. per cubic yard. The lead continues to the W for two miles before it joins the Ringarooma. In the recent annual report the manager reports only one year's reserves of payable material.

Water-rights amounting to 163 s.h. are held on the Weld, Frome and Wyniford Rivers. In conjunction with a dam, 145 s.h. are used in the generation of electric power to the amount of 1400 H.P. It is stated that no further power is required on the mine.

GLADSTONE DISTRICT

Garfield Mine - This mine includes 540 acres situated two miles E of Gladstone held by the Garfield T. M. Co. N.L. Numerous small workings occur on the property where the ground has been worked by individuals or parties in the past. No attempts have been made by the present Company to test the ground between the faces. If the same material extends between the different faces, there is the prospect of a considerable area of tin-bearing ground. Some boring and shaft sinking was carried out on the property about 20 years ago.

Application has been made for water from the Govt. race E of the Ringarooma River. This has to be pumped 103 feet to the head race and crude oil engines and pumps are being installed. These are being erected in separate units for each 10 head of water each consisting of a 50 H.P. Keighley engine and suitable pump. From the head race and dams the water will be distributed to the various faces with a pressure head of 50 feet.

In view of the installation of the crude oil engines no power will be required. The question of nozzle pumps for increased water pressure has not been considered.

South-East Garfield - This mine includes 180 acres situated to the SE of the above and held by the South-East Garfield T. M. Co. N.L. A few old workings reveal deep ground on the property and shafts are being sunk over the shallower parts to test the value of the ground.

Application has been made for 15 s.h. of water from the Government race. A 40 H.P. engine (crude oil) and pump will be needed to lift water 39 feet on to the highest point from which it can be gravitated to any part of the property. In view of erection of oil engine no electric power is required.

Arcadia Mine - This mine includes 320 acres of ground situated three miles to the SE of Gladstone. Deep ground is exposed along the frontage to the Ringarooma River and Amber Creek. Its extent has not been proved by the present company as no bores or shafts have been sunk. It is proposed to use water from a branch of the Mount Cameron Water Race. This will be delivered to parts of the property with pressure of 100 feet, and it would appear that there is a good fall for the tail race so that no power is needed.

The mine is close to the Ringarooma River and if additional supplies of water were required they could be conveniently pumped from the river, which would entail the use of power.

Lawry Bros. Mussel Roe River - This property consists of 85 acres held on the eastern side of the Mussel Roe River about 6 miles SE of Gladstone. The Mussel Roe lead traverses the property from south to north, but is not being worked. The ground being treated is the upper part of the lead together with the shallow ground on the side (particularly the western side) of the lead.

At present 11 s.h. are obtained from the Government race and using for the nozzles and elevating and so no electric power is required. If the Mussel Roe lead contains payable tin ground in its lower parts, electric power would be required for elevating etc.

M.J. Groves - A consolidated lease of 53 acres and another of 5 acres situated 3 miles to the SSE of Gladstone is held by M.J. Groves. The deposit consists of a deep lead running from W to E along a small plateau 200 feet above the Ringarooma River It falls from W to E and cannot be traced to the E past the above section. It has been worked in several places, but not to any great extent. The length of lead within the section is 40 to 60 chains. The payable width is stated to be 4 chains and the depth of face would be 50 to 60 feet. The water supply consists of 6 s.h. and the pressure head is merely the depth of the face. This supply is insufficient to properly work the property. The provision of a greater supply of water probably involving the installation of power would be a matter for a company. The bottom is 10 feet above the Government race and water might be obtained from that source if available. The only alternative appears to be the Ringarooma River. The first scheme would involve perhaps 150 to 100 H.P. and the second 200 to 300 H.P.

It is probable that little, if any, power would be necessary for elevators or gravel pumps.

Compeer Mine - This mine includes 140 acres of land held by the Compeer T. M. Co. N.L. about two miles south of Gladstone. It is shallow ground (up to 10 to 15 feet deep) following the present creeks and surface. With one plant it is estimated by the Company that there is 7 to 10 years work ahead. The water supply is obtained from a branch of the Mount Cameron Water Race. It is then pumped through 2,500 feet of pipes to the face 100 feet above the plant with a maximum pressure of 200 feet. The lower plant consists of a portable boiler and 100 H.P. steam engine. It is desired to increase the power to 200 H.P. and this amount of electric power would be taken if available in time.

Fly-by-Night - Leases totalling 55 acres are held by Johnson and Petts and application has been made for an additional 160 acres. These leases are situated immediately to the south of the township of Gladstone and are being worked at present by a Hobart Syndicate. A considerable area of shallow alluvial and detrital ground exists on the leases. In addition lease 1098 and probably also 9710 is occupied by greisenised granite containing numerous irregular veins of tin-bearing mica and quartz mica greisen. It is these veins that have contributed mainly to the richness of the alluvial and detrital matter.

It is the present intention to treat all the alluvial and detrital material by hydraulic sluicing. During this sluicing all the greisen pebbles and boulders will be stacked and will be crushed at a later date. It is also proposed to treat the whole of the greisenised granite and the contained greisen veins.

A water supply of 4 s.h. is at present being obtained from the Government race at the head of the pipe line across Fly-by-Night Creek. This only gives a small pressure head and it is proposed to take the water from the race to the SE of the mine and put it into a reservoir on 1788/W from which a maximum pressure of 117 feet could be obtained. This supply will have to be lifted 50 feet and a Fordson tractor of 25 H.P. and a two-stage six inch centrifugal pump are being installed. Later if necessary a further plant will be put in to pump water from the Ringarooma River and the two will in conjunction lift this water into the above dam.

Scotia Mine - This mine and the adjacent ground is included in leases covering 200 acres, leased principally in the name of E.M. Shields. The leases include the old Scotia mine and the extension of the lead to the northward. The ground consists of deep ground with a narrow gutter trending northwards. The ground ahead of the faces has been bored several times, some of the holes showing payable ground and others unpayable. The leases are at present under option to a Melbourne Company.

If work is resumed a water supply would be obtained from the Ringarooma River which flows immediately to the S of the property. From 10 to 15 s.h. would be lifted and given a pressure of 150 feet at the nozzles, involving the use of 100 to 150 H.P. Power would probably also be required to the extent of 100 H.P. for gravel pumps.

Lochaber Mine - An area of 39 acres in the vicinity of the old workings of this mine is held under lease to E. R. Groves but the mine is not being worked. The form of the workings indicates probably a lead running to the NW. The greatest depth of face is 35 feet but it is stated that bottom was not reached at the NW end. The mine has not been worked since the Government water was cut off. If restarted, the Ringarooma River is close by and would give a sufficient supply of water which would however have to be pumped and the working of the mine would involve the use of 200 to 300 H.P.

M.J. Groves - Leases totalling 200 acres are held in this name to the NW of the Lochaber. They have been recently bored but the results are not known. The lead of the Lochaber, if such exists, probably traverses these sections.

J. Stoddart Barr and E.M. Stevens - Leases amounting to 560 acres are held in these names to the NW of the Scotia

Mine. They have been bored recently but the results obtained were not sufficient to warrant the commencement of mining.

MacGreggor and Aberfoyle Areas - A considerable extent of ground has been worked in this vicinity and much of a similar class of ground remains. The value of this virgin ground is not known and active mining operations are not being carried on at present.

Monaroh Mine - Leases totalling 348 acres are held by the Monaroh T.M. Co. N.L. on Vicary Creek, five miles west of Gladstone. The leases have been closely bored and have proved the existence of two leads viz those of Vicary and Shallamar Creeks, and the combined lead after their junction. One to one and a half miles of lead has thus been proved and it is stated that the ground contains sufficient tin ore to be payable. The deepest ground is 33 feet. The water supply consists of 22 s.h. from the Boobyalla River of which 16 s.h. can be delivered by the race. The pressure is small and it is proposed to use a 20 s.h. portable marshall boiler and steam engine and a 4 stage Robinson pump to give a pressure of 180 feet. A 25 H.P. Roley steam engine and gravel pump will also be installed to pump the broken material.

The steam power might be discarded for electric if the latter were available. The question of installing another plant might also be considered which would also require power.

Dredging Areas - Numerous areas such as Dorset Flats, Jewell's and Rushton's Flat, Black Duck, MacGregor Flats are being bored by Tasmanian Tin to prove if satisfactory for dredging. Should any of these areas be suitable, the plant erected on each would represent a demand for several hundred horse power.

SOUTH MOUNT CAMERON AND WYNIFORD RIVER DISTRICT

Endurance Mine - The Endurance T.M. Co. N.L. hold a considerable area of ground under lease in the immediate vicinity of South Mount Cameron. Practically the whole of this ground has been tested by bores and shafts and the payable areas delineated.

The ground is divisible into a number of parts each of which will be worked separately.

(1) The group of sections (total area 107 acres) around the mouth of Ruby Creek and its junction with the Ringarooma River. Three leads traverse these flats and junction at the northern end to form the Ringarooma River lead. A plant (suction dredge) is now being installed to work this group. Three oil engines with a total power of 260 H.P. are the source of power. If electric power had been available it would have been used.

(2) The group of sections (area 61 acres) to the east and north of the above. These occupy the flats along the Ringarooma River and contain a lead of the latter. A plant similar to the above will be installed later to work this part. A further amount of 260 H.P. will therefore be required and electric power will be taken if available.

(3) Eastern half of Lease 9018. An area 60 chains long by 10 chains wide occupies the terrace at the above locality. It has been bored and proved payable. This

will be sluiced when the central part of the above lease has been worked out.

(4) Present workings along Sapphire Creek. The deposit represents the lead of this stream with a maximum depth of 30 feet. The greater part of this deposit has now been worked out. The present plant consists of two steam boilers and two vertical steam engines with total power of 340 H.P. The 200 H.P. engine drives the nozzle pump and the 140 H.P. engine drives the gravel pump.

(5) Western part of Lease 9018. A considerable area of ground remains to be worked towards the old Clifton workings and up Clifton Creek.
It is proposed to instal at a later date a plant requiring 150 H.P. If electric power is available at the time, it would be utilised.

(6) In addition to the above, there are other areas of ground on the southern and central parts of 9018 which will be sluiced when the deposits on the lower lying have been worked.
There is thus an immediate demand for 450 H.P. if it was available at the present or immediate future.

Eastern Lead - The Eastern Lead T. M. Co. N.L. holds 285 acres along the road between Pioneer and South Mount Cameron. A plant is being installed to commence work up the course of A.B.C. Creek. The water supply is obtained from the Wyniford River, 12 s.h. being delivered with a pressure of 60 feet. The plant consists of a power house with suction gas plant using charcoal, a suction gas engine of 105 H.P. and dynamo of 90 H.P. The barge will be equipped with 75 H.P. motor, gravel pump, etc. The A.B.C. Creek has been bored and while the drifts are at least 40 feet thick in places only the upper 8 feet have been proved payable. Work will be commenced 12 chains below the road bridge and continued up the valley. Later a more powerful plant may be installed to work the harder ground to the north of the leases. In addition to the A.B.C. lead much of the remainder of the surface carries tin ore to shallow depths.

New Clifton - The New Clifton T.M. Co. N.L. holds 407 acres under lease or for which application has been made. These leases extend along Clifton Creek and also along Ruby Creek below the junction of these two creeks.

The property has been partly or wholly bored, and as a consequence of the results obtained, a plant is now being installed. Water-rights for 10 s.h. are held on Ruby Creek. Power will be required for a nozzle pump and possibly also for elevating the ground. The power is to be supplied by a crude oil engine.

Rajah Mine - The Rajah T.M. Co. N.L. holds 64 acres in one group of sections along the Wyniford River and another 10 acre block further north. These leases are in the form of a narrow strip along the Wyniford River and include the lead of this stream. The alluvial flats have an average width of 2 to 5 chains and the ground averages 18 feet in depth. The water supply is obtained from Wyniford River and its tributaries. One race, 7/W will supply water for the nozzle and that from the dam on Deep Creek will supply the hydraulic elevator. Work is being commenced at the northern end and will be continued to the south. No power is required.

Waugh Mine - The Waugh T.M. Co. N.L. has leases covering 71 acres along the course of the Wyniford River. These include the lead of the Wyniford River. Work is at present being carried out at the southern end of the leases. Numerous old workings occur to the north, and some parts of the lead have apparently been worked out. The width of the alluvial flats ranges from 1 to 5 chains and the depth from 15 to 20 feet. A water supply is obtained from the Wyniford River which supplies water for sluicing and also for driving a Pelton wheel which operates a gravel pump for elevating the material. No hydro-electric power is required.

RUBY FLAT DISTRICT

Royal Gordon Mine - Leases totalling 75 acres are held by Messrs. W.A. and O.J. Walsh on the eastern side of Mount George. Sluicing operations are being carried out on a tin-bearing soft granite. The granite carries cassiterite throughout and its relative softness is due to its alteration by the tin-bearing solutions or vapours. The granite is sufficiently soft to enable it to be sluiced similarly to alluvial ground. An area of 1½ to 2 acres has been sluiced to depths ranging up to 30 feet.

From approximate calculations it would appear that the ground in the northern end averages 1 lb. per cubic yard, while the southern end is probably richer. The present owners are bringing in the tail race at a lower grade and thereby sluicing the granite to greater depths. The present water supply is from the Nugget Race and is brought from Pearce Cascade Creek after being used in the Mt. Ruby leases. Supplies with greater pressure could be obtained by using the Nugget Race water direct instead of as above or using the Black Creek Race water. The only scheme involving power would be to bring in a low level supply from Pearce Cascade Creek and use nozzle pumps, in which case 100 to 200 H.P. could be used.

The extent of tin-bearing granite has not been proved beyond the face of the workings. The greatest extention is likely to occur in a westerly direction.

Ruby Flat - Messrs. W.A. and O.J. Walsh hold 238 acres under lease in the Ruby Flat area. This area was largely covered by alluvial and detrital deposits ranging up to 12 feet in thickness. A large proportion of these deposits have been sluiced away in the past particularly along the creeks and gullies, but a considerable area of virgin ground remains to be worked. At present sluicing operations are being carried on at the south-eastern part of the property near the junction of Pearce Cascade and Argyle Creeks. The water from the Black Creek race is being used for sluicing. The sluiced material does not need to be elevated and no power is required.

Baker's Discovery - The Baker's Discovery T.M. Co. N.L. has leases totalling 118 acres to the south of Ruby Flat. Work is being carried out on Section 9177/M. Several quartz greisen veins traverse the northern part of this section with a general bearing of 110 degrees. Small patches of rich tin-bearing mica greisen occur in these veins. The quartz greisen veins are being worked at present in a search for the mica greisen patches, and all broken material is sluiced for tin ore. Alluvial ground occurs on the southern part of above lease and possibly on some of the other leases. One s.h. of water is used under low pressure.

Mt. Ruby - The Mount Ruby Tin Mines N.L. holds 50 acres under lease along the Pearce Cascade and Argyle Creeks. Several quartz greisen lodes including those worked by the Guiding Star Co. traverse the leases. A large area of the leases was formerly covered by alluvial deposits. A large proportion of the alluvial has been sluiced in the past, but a considerable area of virgin ground still remains. A small water supply is obtained from the heads of Argyle and Pearce Cascade Creeks, but with only a small pressure head. At present, water from the Nugget Race is being used by arrangement with Walsh Bros. and the mine is being worked on tribute. No power would be required.

Mt. Paris - T. McQuay and others hold 61 acres around Mt. Paris. Several hard quartz greisen lodes traverse the property in a general east and west direction. Adit crosscuts were driven in northerly directions to prospect these lodes by various companies, but the latter met with little success. The present owners are arranging to treat the soft tin-bearing granite which exists between parts of the greisen lodes. It is stated to be sufficiently soft to be sluiced and will be worked as far as possible by this method. A long water-race is being brought from the New River for this purpose. Power will not be required while sluicing, but it would if the greisen lodes are ever worked or the soft granite worked by other means than sluicing.

BLACK CREEK DISTRICT

Montrose Creek - Walsh Bros. hold a tract of ground along Montrose Creek as portion of lease 9526/M of 47 acres. The deposits along the upper part of this creek have been worked by Bessell for a narrow width. Walsh Bros. are at present working a width of 2 to 3 chains and sluicing out for a dam site. The lead continues with a general easterly bearing through the Montrose flats towards Black Creek for a length of nearly 30 chains and width ranging up to 10 chains. It is the intention of the owners to bring a tail race up the flat from Black Creek and work the deep ground of the Montrose lead. Water from the Nugget race is being used at present, but when the dam is completed, a low-level race from Black Creek will be utilised. Power will not be required for working this ground.

Leases 9526 and 9183/M - The western part of consolidated lease 9526/M and lease 9183/M are occupied by tin-bearing altered granites. The granite is a soft white mica granite occasionally containing tourmaline. Prospects of tin ore can be washed from it at many places and part of it has been sluiced in the face of the Hope Company.

The surface material (detrital and alluvial) is stated to contain good tin ore and good prospects can be washed from it at some places. This surface material will be sluiced as will also be the soft tin-bearing granite where it is sufficiently soft. The Nugget race water will be used for this purpose and no power will be required.

Sections 8539 and 8782 - Soft tin-bearing granite formations occupy these sections. They were exposed in sluicing the alluvial deposits and have been themselves sluiced to shallow depths. Water from the Nugget race will be used to work this granite and power is not required at present. The extent of the deposit has not been proved beyond the limits of the workings.

Section 8782 (Woods) - Soft tin-bearing granite occurs on this lease and a considerable amount has been sluiced away. It is generally similar to that on the above leases and could be worked with water from the Nugget Race. The extent has not been proved and power is not required at present.

Bell's Plains - An area totalling 300 to 400 acres is held along and to the east of the head of Black Creek. The deposits are shallow alluvial ones and have been worked by water-supplies obtained from the headwater streams of Black Creek. The greater part of this area has recently been acquired by a company (Bell's Plains) for working.

(2) PRIMARY DEPOSITS

Primary tin deposits occur at numerous localities throughout the north-eastern district. Within the areas under review they are restricted, with one or two unimportant exceptions, to the Devonian granite. The deposits assume various types, such as greisen lodes, quartz veins, greisenised granite and altered granite (or tin-bearing granite) in different forms. The largest and most important of these occur along a narrow tract of country with a general east-west trend between Branxholm and Poimena or Lottah. This arrangement is not merely accidental, but has a geological significance as this tract corresponds approximately to the highest part of this portion of the granite batholith of north-eastern Tasmania.

GLADSTONE DISTRICT

Fly-by-Night - This deposit of greisenised granite with narrow greisen and quartz veins has already been referred to. It is the intention of the owners to treat this material when the alluvial and detrital matter has been sluiced off the property. It is an impossible task to determine the value of the formation, owing to the erratic distribution of the cassiterite in it. The Pioneer Company sank one or two shafts, cut a long trench, and drove a tunnel with this object in view. It would require more work of this type, and numerous drill holes and/or shafts to achieve a satisfactory result.

The treatment of the material would consist of mining it in an open face, crushing it and then concentrating the cassiterite in jigs, tables etc. It is stated that when this plan is carried into effect that electric power ranging up to 500 H.P. would be taken if available. A small syndicate holds the property at present and it is anticipated that a stronger financial company would be essential to carrying out the above plan.

Compeer Mine - On sections 8785/M (5 acres) and 9528/M (10 acres) of the Compeer Co., soft tin-bearing granite occurs. It was exposed by sluicing operations in the head of Pyke's Creek and is associated with orthoclase granite. A few narrow quartz veins with a general northerly trend traverse the granite. The quartz contains cassiterite and chalcopyrite. Assays of grab samples indicate that the quartz carries approximately 1% of tin while the granite contains 0.05% in the vicinity of the quartz veins and 0.07% in the softer portions of the granite. From these it would appear that the quartz veins are the only parts of the formation with sufficient tin ore for crushing and these are too narrow for economic working. The softer portions of the granite could possibly be sluiced. The only power would be that required for providing a water-supply. The

same power used for the alluvial ground could later be used for this purpose.

BRANXHOLM-WELDBOROUGH DISTRICT

The tract of country between Mount George and the summit of the Blue Tier to the south of Weldborough is one containing numerous primary deposits of tin ore. This tract is one with a width of 1 to 2 miles and a general trend of 100 degrees to 110 degrees. It is really continuous from St. Marys to Poimena - a total length of 15 miles - but will be described in two parts viz the above and the Blue Tier district. The primary deposits in the district consist of (a) Soft altered granite formations. These are generally sufficiently soft to be sluiced and many have been so treated. Descriptions of these have therefore been given above in dealing with the Ruby Flat and Black Creek areas. (b) Greisen veins. These consist of glassy quartz and white mica with small amounts of cassiterite and chalcopyrite. They are exceedingly numerous and have a large range in dimensions. The largest and richest have been worked to a very small extent in the past the work generally consisting of treating payable shoots of ore without any search for other shoots. The most important ones which have been worked are from west to east - Contact, Big Lode and Smith's Lode (on the Guiding Star mine), Tin Pot Creek, and Bell Hill. Further east there are others such as Mammoth and Star of Peace probably of the same nature. These lode mines are not being worked at present but may possibly be worked in the future when supplies of alluvial tin ore are depleted. As such they therefore represent potential users of power.

BLUE TIER DISTRICT

This district embraces the eastern end of the Blue Tier in the vicinity of Lottah and Poimena. It is occupied almost entirely by Devonian granite of the normal porphyritic type. In the vicinity of the above townships a tin-bearing variety of altered granite occurs over a very extensive area. Numerous mines have been opened up on these formations the most important being the Anchor, Australian (Puzzle and Don faces), Liberator, Crystal Hill, Haley's Lease, Moon, Michael, Lottah, and Laffer. The Anchor has been developed to the greatest extent and work carried out on a large scale. It was worked intermittently and on a small scale between 1880 and 1900. It is stated that prior to 1892, 30,734 tons were crushed for 288 tons of tin ore, an average of 0.937%. Work on a larger scale was begun about 1900 and from June 1900 till December 1914, 2497.48 tons of tin ore were obtained. Full details of the grade of the ore are not available, but it appears that it ranged from 0.15 to 0.40% tin oxide the lower values being obtained during the greater part of the above period. It is unofficially stated that the average grade of the ore treated over a considerable period was 0.156% tin oxide. At present the only mines working are the Anchor and the Michael. At the former a 10-head battery and treatment plant is in operation and the property is being worked by a local syndicate. At the Michael Mine a small mainland company is operating and have installed a 15-head battery and treatment plant. Sluicing is being carried on at Haley's Lease, but the remainder of the mines are idle.

The above formations and mines were described by the late W.H. Twelvetrees in 1901 prepared for a purpose

similar to that of the present report. No further descriptions will therefore be given. These formations represent a problem of mining and treatment on a large scale of extensive low grade tin ore deposits. They are certainly low-grade and their successful exploitation depends largely on the price of tin. With prices at or above those (£300 per ton) ruling at the presenttime, it is by no means impossible that the deposits can be successfully exploited. The greater the depletion of the alluvial deposits of the world, the higher will the price of tin rise, and increasing attention will be given to the production of tin ore from lode mines. It is under such conditions that these deposits will probably be worked and they therefore form an important potential reserve of tin ore and are potential users of hydro-electric power.

TIN STATISTICS

As tin mines form the greater number of the mines of the north-eastern district and the question of the introduction of hydro-electric power into the district depends upon them and their future, statistics in connection with the production, consumption, value etc. of tin have a considerable bearing on the point and will be discussed below.

Production

The statistics of the world's production since 1880 are given in the attached table. They show a continuous increase from 1880 to 1925 with only a few interruptions at irregular intervals. These interruptions or decreases were generally spread over a short period and did not affect the general and continuous increase indicated above.

Taking the first and last of the above years the increased production is 105,536 tons over a period of 45 years or an average annual increase of 2345 tons.

Consumption

Actual statistics of annual consumption are not available or readily obtainable. The face that as a rule, the world's stocks of tin are small, tends to show that consumption is practically always equal to the production. The greatest divergence between these probably occurred during the years between 1920 and 1923, when visible stocks of over 50,000 tons accumulated. These stocks rapidly decreased and at the end of 1924, only 20,000 tons remained. For 1925, it was estimated that an increased production would be necessary to prevent stocks being further reduced. This increased production was achieved but whether it prevented stocks falling cannot be determined. Some authorities considered the stocks at the end of 1925 had decreased another 6000 tons. It seems safe to assume therefore that the consumption for 1925 was approximately 149,000 tons. About 70% of the world's tin is used by U.S.A. In 1925 the tin and terne plate industries accounted for 26,268 tons and the automobile industry for 12,000 tons.

SOURCES OF THE WORLD'S SUPPLY

The most important producing countries during 1925 were:-

Federated Malay States	45,925 tons
Bolivia	32,083 "
Banka	20,824 "

Billiton	9,763	tons
China	8,000	"
Siam	6,802	"
Nigeria	6,186	"
Australia	2,708	"
Great Britain	2,500	"
Unfederated Malay States	2,132	"
Congo	2,000	"

The most important source of lode tin is Bolivia. The most important sources of alluvial tin are the states of south-eastern Asia which account for the above year 93,446 tons out of the total production of 143,157 tons. This former quantity is practically all alluvial tin and it amounts to 65% of the whole. Taking into account the other sources, it is safe to assure that at lease 70% of the worlds tin supply is derived from alluvial deposits.

Future Supplies

As seen above, at least 70% of the world's supply is derived from alluvial deposits. These deposits are generally easy to work and are relatively quickly worked out. The deposits upon which the future supplies largely depends are thus being rapidly exhausted. It is probable that in 10 to 20 years the production from the Federated Malay States will be only a fraction of the present one. Other alluvial fields may be discovered throughout the world but it is not likely that the production from these will make up for the decreased production from the known ones.

The only other available sources are the lode deposits of the world. These are not particularly favoured by investors at the present time owing to the greater difficulty in testing them to determine if profitable and later in working them. Nevertheless the lodes will have to be worked in the near future as the alluvial deposits become depleted.

Price of Tin

The average annual prices of tin for the period 1887 to 1925 are given in the attached table. It is to be noted that the price was lowest in 1896 but since then there has been a general increase with several periods of depression. Of the latter it can be safely said that the one in 1914 and 1915 was due to the disorganisation etc. brought about by the commencement of the Great War and the one in 1919 to 1923 was due to similar causes arising after the close of the war. In spite of these temporary depressions, the general tendency has been to a steady increase in the price.

GENERAL REMARKS

It will be observed from the tables I and II that the production and price have both been increasing. Any relation between them does not take the usual form of increased production causing a reduction in price. The production has been steadily rising since 1880 and the price has been doing the same since 1896. Since 1896, falls in the price have generally been followed by decreases in production.

The general conclusions to be drawn from the above are that the price of tin during the past 30 years has been practically independent of the production and that this could only be brought about by the fact that the production has

seldom exceeded the increasing demand for it and that the visible world's stock is always small. The same position also applies to the present time and the tin market is remarkably good and there is every reason to expect the present high ruling price to continue. Moreover, the decrease in production due to the depletion of alluvial deposits must tend to keep the price at a high level. Apart from discoveries of new alluvial fields, the lodes will be called upon to supply the deficiency in production to a much greater extent as time goes on.

EFFECT OF PRICE ON THE TIN MINES OF THE NORTH EAST

This subject can only be dealt with in a general way, as conditions vary greatly from mine to mine and each case would involve a detailed investigation.

With regard to the alluvial mines, it may be said that so long as the price of tin is in excess of £200 per ton, the majority would be able to continue profitable exploitations. With the price below £200 per ton, operations would in most instances be unprofitable. The lode deposits are practically unworked at present. This is due primarily to the fact that alluvial deposits are easier to test and to work than the lode ones. As the alluvial is depleted then the lodes will have to be worked. Nevertheless it is probable that the present price (£300 per ton) will have to be at least maintained to enable future operations to be successfully carried out.

HOW POWER COULD BE USED IN THE MINING INDUSTRY

The mining industry is, or could, be a larger consumer of electric power. Such power could be used in a variety of ways.

Alluvial - The most important ways in which it could be used are as follows:-

For nozzle pumps
For gravel pumps
For mechanical elevators.

Lode - Power can be used in a variety of ways in lode mining such as :-

Air compressors
Winding engines
Pumps
Transport
Treatment plants.

PRESENT AND FUTURE DEMANDS FOR POWER

If the electric power were available in the north eastern districts at the present time, 1050 H.P. would be ordered immediately, and this demand might under certain conditions reach 1250 H.P.

In addition there would be a probable further demand consequent upon the actual presence of the power, but which cannot now be ascertained or expressed in figures.

In addition to the power represented by the water used in the mines at present and the above demand of 1050 to 1250, the power which could be absorbed if all the alluvial mines were working would be from 1400 to 3000 H.P.

No estimate is made of the power likely to be absorbed if the lode mines especially those of the Blue Tier and the Branxholm-Weldborough district were to be worked. It may be safely assumed however to amount to a few thousand horse power. It is evident therefore that as the alluvial mines become worked out and the working of the lode mines begin, that the amount of power used by the latter would be approximately equal to that taken by the former.

THE PROBABLE LIFE OF THE MINE.

The probable life of a mine depends upon many factors which also vary from mine to mine. In the case of shallow alluvial mines the probable life could be approximately determined if the mine were tested by a through system of boring to ascertain the extent depth and value of the material. In very few cases has this been done and so it is impossible to determine accurately the life of the mines. It may be stated generally however that the life of these mines will range from a few up to 20 years.

In the case of the mines on the Ringarooma system of deep leads, the same principle of testing could be applied, but it is a much more difficult proposition owing to the deeper nature of the overburden and the tin-bearing drifts. The deep lead mines should have considerably longer lives than the shallower ones owing to the enormous quantities of the drifts in the leads. All the mines are working down the leads and are therefore getting into poorer and deeper ground. The lives of these mines will be determined by the economic considerations when the tin content of the drifts gets so low and the amount of overburden (basalt and barren drifts) so great that they cannot be profitably worked.

In the case of lode mines, the life can only be determined by extensive boring or underground development work to ascertain the value of the ore. As this has not been done, it is impossible to forecast the life of the mines. It may be stated that providing the grade is sufficiently high, very large quantities of ore occur, especially on the Blue Tier, and the mines would have long lives.

THE POSSIBILITY OF THE MINES INCREASING THE SCOPE OF OPERATIONS IF ELECTRIC POWER IS PROVIDED.

In considering this question, it may be stated that if any particular mine had sufficient material to treat and electric power were available, then it would extend its scope and use electric power. If the same condition holds good, but electric power is not available, then other sources of power will be used to extend the scope of operations. This is actually occurring at the present, crude oil engines being installed where required. The longer the district is without electric power, the greater the number of mines which will be equipped with other sources especially crude oil engines, and the less will become the number of mines left to be eqipped with electric power.

The supply of electric power at a rate below the cost of power from other sources might probably cause operations to be extended to any low grade areas occurring which could not be worked with the more costly power.

Conclusions

The supply of power to the North-eastern districts depends mainly upon the quantity which will be taken by the alluvial mines working at the present time. In the above reports, therefore, brief descriptions have been given of these mines, particularly those in the tract of country between Ringarooma and Gladstone. Descriptions have also been given of mines not working at present but which may be worked in the future. In the majority of these alluvial mines water under gravitational pressure is the power used. In a few mines, power is obtained from the following sources - hydro-electric, crude oil engines, and steam engine (with wood fuel).

The probable lives of the shallower mines are dependant upon many circumstances, but will probably range up to 20 years. The deep lead mines should tend to have greater lives limited only by economic circumstances.

If hydro-electric power were available in the north-eastern districts now, a demand for 1050 to 1250 would be made at once. If the unworked alluvial mines be taken into consideration there would be a further potential demand of 1400 to 3000 H.P. Tin occupies a very strong position in theworld's markets. The production has been slowly increasing for a number of years, but the consumption has increased at at least an equal rate and visible stocks are always low. About 70% of the world's production comes from alluvial deposits of which those of south-eastern Asia are the largest producers at present. These have reached their maximum production, which will decline in the future. Thus a shortage of tin supplies will tend to occur unless production from other sources is possible. The direct effects of this shortage will be:-

(1) To maintain the price of tin at its present or a higher figure.

(2) To cause the exploitation of the lode deposits of tin ore.

There is every reason to expect therefore that the future of the tin mining industry should be a successful one, especially as regards the remaining alluvial deposits.

The higher price of tin would tend to make tin lode-mining a profitable business. In fact after the depletion of the alluvial deposits the price of tin will have to rise to a sufficient figure to render the lode mining profitable in order to maintain supplies.

The north eastern districts also contain numerous lodes and tin-bearing formations. These occur in the Branxholm-Weldborough district as greisen lodes and soft tin-bearing granitic formations.

Perhaps the most important district is that of the Blue Tier where immense quantities of low grade tin-bearing granitic formations occur.

As the demand for power decreases in alluvial mining, it will therefore probably increase in lode mining. Several thousand H.P. could be used in connection with the latter and would thus absorb all the power formerly supplied to alluvial mines.

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4th April, 1926.

TABLE I

WORLD'S PRODUCTION OF TIN.

(In tons of 2240 lbs)

1880	-	38,321	1896	-	81,922	1912	-	122,516
1881	-	39,403	1897	-	74,218	1913	-	133,268
1882	-	39,671	1898	-	74,121	1914	-	123,854
1883	-	45,746	1899	-	77,350	1915	-	126,860
1884	-	44,378	1900	-	93,353	1916	-	125,447
1885	-	43,923	1901	-	95,905	1917	-	130,207
1886	-	45,911	1902	-	98,708	1918	-	124,789
1887	-	51,353	1903	-	95,344	1919	-	121,520
1888	-	52,054	1904	-	100,193	1920	-	122,910
1889	-	55,367	1905	-	99,203	1921	-	109,709
1890	-	55,098	1906	-	101,035	1922	-	129,329
1891	-	64,324	1907	-	98,284	1923	-	124,747
1892	-	69,521	1908	-	108,833	1924	-	140,847
1893	-	73,642	1909	-	112,211	1925	-	143,157
1894	-	7[illegible],549	1910	-	113,930			
1895	-	82,098	1911	-	117,020			

TABLE II

Tin Prices.

Year		Amount	Year		Amount
1887	-	£111	1907	-	£172
1888	-	117	1908	-	133
1889	-	93	1909	-	134
1890	-	94	1910	-	155
1891	-	91	1911	-	192
1892	-	93	1912	-	209
1893	-	85	1913	-	201
1894	-	68	1914	-	151
1895	-	63	1915	-	164
1896	-	59	1916	-	182
1897	-	61	1917	-	237
1898	-	71	1918	-	329
1899	-	122	1919	-	257
1900	-	133	1920	-	296
1901	-	118	1921	-	165
1902	-	120	1922	-	159
1903	-	127	1923	-	191
1904	-	126	1924	-	248
1905	-	143	1925	-	261
1906	-	180			