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GEOLOGICAL SURVEY BULLETIN

No. 27

The Bangor Mineral District

BY

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Issued under the authority of

The Honourable Sir NEIL ELLIOTT LEWIS, K.C.M.G.
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The Bangor Mineral District.

I.—INTRODUCTION.

THE mineral resources of the district of Bangor have recently attracted public attention, mainly on account of the existence there of large bodies of slate of a certain commercial quality. Deposits of slate, coal, and reefs of gold-bearing quartz have long been known to occur, but have been neglected for a good many years. Now, however, that the necessity is manifesting itself for utilising in all possible ways the dormant resources of the State, it has been felt that an examination of the various deposits might prove useful to the community.

The present high price of galvanised-iron roofing has caused consumers to look round the Commonwealth for substitutes for building purposes, and if suitable slate can be found, now is the time for making the best use of the occurrences. Tasmania possesses in many localities deposits of slate which cleaves in the familiar way, but many of them are too inaccessible, or have one defect or another, which, with cheap iron available, has prevented them from being placed on the market.

Under these circumstances no surprise need be felt that interest has revived in the Bangor slate quarries, which at one time were actively worked, and disposed of a lot of their product in Victoria. Land for slate-working was surveyed as far back as 1872 for Messrs. Aikenhead and Blair; and even prior to this it seems to have had attention, for the section had been previously in the hands of Major L. Hood. About this time, too, T. C. Just's quarry, in the northern part of the district, appears to have been worked. At any rate, the early work at Bangor can be traced back to 45 years ago. Two or three years after that, according to information obtained on the spot, a Launceston syndicate started to quarry. After an interval of about 13 years these proprietors were succeeded by the Melbourne firm of David Blair and Joseph Clarke, who sank a main shaft and raised slate from underground. These owners imported Welsh and Cornish quarrymen, put up some 50 cottages, installed an extensive slate-working

plant, and carried on with bustle and activity for about three years. The advent of the galvanised iron roof era, combined with a very expensive method of working the deposit, led to the suspension of operations; and the whole of the plant, tramway, and cottages were finally advertised in the Launceston press to be sold by auction on the 2nd March, 1888. It is interesting to note that the syndicate had 8 slate saw-benches, 13 slate dressing-machines, 1 slate planing-machine, 3 saw-sharpening machines, 1 emery grinding-machine, 5 wooden slate saw-benches, 5 steam-engines, and 11 miles of tramway to Egg Island jetty, on the east bank of the Tamar.

This was the end of the Bangor slate enterprise, which, by all accounts, seems to have had a grievous career. The slates were placed on the mainland market, and are said to have given satisfaction. Some buildings in Hobart and Launceston were roofed with them, but owing to slate having been imported from Bangor in Wales, some confusion exists in the reports, and the place of origin cannot now always be ascertained with certainty. The output being principally absorbed by Victoria, the slates were never on the market to any great extent, though used in individual instances, and the local reports of the quality are conflicting.

II.—LOCALITY.

Access to the district is from the Karoola Station, on the Scottsdale Railway, 11 miles due north of Launceston, and 17 miles along the route followed by the line. A good metalled road from Karoola follows the valley of the Piper River through pleasant-looking farm lands for 4 miles, when a moderate ascent brings the traveller to the tiny settlement, consisting of the post-office and store, the school, and the Anglican church, which forms the nominal centre of the Bangor district. Lilydale lies 5 or 6 miles to the south-east.

Bangor owes its name to its slate quarries, in allusion to the Bangor quarries in North Wales, from which district many of the old workmen came.

The quarry works here are situate about a quarter of a mile south-west of the post-office, and can be approached in either of two ways—(1) from the main road at the bottom of the hill, where it crosses the Second River, and then following the north bank of that river at the foot of the steep bluff in which the slate has been worked; or (2) by a track westwards from the post-office through the bush to the level brow of the bluff, where the shaft was sunk from which the principal output of slate came.

The south face of the bluff, where the hill range terminates and falls abruptly to the wide flat valley of the Piper, is clothed with a talus of waste rock from the shaft, and forms a striking object in the landscape as the traveller approaches from Karoola, being visible for a couple of miles. There are large quantities of slate spoil lying on these tips, probably several thousand tons, forming a mantle on the steep side of the hill, through which the young shrubs on the slope have in places grown.

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III.—GEOLOGY.

The slate beds, as far as can be seen from the exposures of rock in the district, form a somewhat narrow belt of country running north-west-south-east. Roughly, this belt continues in the same direction uninterruptedly to the coast-line on Bass Strait, widening as it goes north. Its exposed width at Bangor is from the air-shaft at the quarry tip to the river on the west, or about 1000 feet. The slate comes up also to view on the east, below the soft Permo-Carboniferous sandstone on the main-road up the hill to the post-office. There is also slate on a low hill on S. A. Baker's property, south of the Second River. The present bulletin deals with this strip of slate country from the Bangor quarries in the south to T. C. Just's quarry in the north.

The planes of the slaty cleavage appear to be coincident with those of the bedding; at least, there is no sign by which one can be distinguished from the other. The dip or underlay is extremely flat, which is an advantage in working. In the main-road drain it is north-easterly; along the old tramway on the west side of the quarries it inclines, if anything, to the south-west. The strike is, roughly, that of the beds.

Further south the slate country has suffered denudation, and is buried beneath Permo-Carboniferous mudstones. The slate is unfossiliferous, but it belongs to a group of sediments assumed to belong to the Ordovician period. It is in general a dark-grey to bluish-black clay slate, carrying minute grains or crystals of iron pyrites. These are apt to weather out, leaving almost microscopic cavities in the stone. Pyrite is not considered objectionable from an economic point of view; marcasite, the ferrous sulphide, yields to oxidation more rapidly than pyrite, and would have been a decidedly deleterious ingredient.

The rock is readily cleavable and cleaves true, except where it is hard, as is found to be the case in places towards the northern end of the field, where quartz veins and other accompaniments of mineralisation are present. In some instances it hardens very materially, showing sharp and almost flinty edges, and makes a useful road-forming material.

IV.—SLATE-QUARRYING.

The two leases which have been recently taken up in the district are situate a couple of miles apart—W. J. Hammersley's 40 acres, 7693-M, which was formerly T. C. Just's block, being at the northern end of the field, on the west bank of Piper's River; and J. Southerwood's 40 acres, 7670-M, comprising the old Bangor quarries, being further south, in the angle formed by the junction of the Second River with Piper's River.

Bangor Quarries—40 Acres, Section 7670-M.

The Second River, before uniting with Piper's River, flows at the foot of the hill ridge which forms the termination of the hilly slate country. At the southern end of the hill is a wide tunnel, which has been driven for a distance of about 400 feet, connecting with the shaft from the summit of the ridge at about the 100-feet level. A little distance in, it is blocked by water, so that the measurements cannot be verified until it is unwatered. For the distance for which it is accessible it passes through slate of apparently uniform second or third grade quality. About a couple of hundred feet further south-west along the face of the hill is a small quarry, which is said to have been the first that was started here in the old times. Further west towards the junction of the two rivers is the old main quarry, said to have been working 43 years ago. It is now partly filled with rubbish from the tip of the shaft on the brow of the hill, but enough can be seen to show the massive nature of the slate ground, and the facilities which exist for open-cut working. Outside in the grass are numbers of what are said to have been third-class slates, and it is remarkable how well these have been preserved in the grass and soil for so many years. The best quality slates have been sent away to market, and only the weathered surfaces of the rock in the quarry are open to observation, but from every appearance there is here a large body of slate, a proportion of which ought to be marketable under present conditions. The floor of the quarry is about 25 feet above river-level, which is hardly high enough for a large permanent tip. Wherever quarries are opened along this face, the spoil would have to be conveyed along the river bank to some convenient flats on the section, which

would answer requirements for a while; or perhaps arrangements could be made with the owners of land across the river for an extension of the dumps. The Melbourne Company formed a large tip from the shaft, but working underground quarries by means of shafts is a most expensive method, and should not be adopted unless absolutely necessary. One may be permitted to imagine that the motive which actuated the owners in this case was to get at the higher-grade slate, which is said to characterise the deeper horizons. Vertical shafts, nevertheless, are used when the necessity cannot be avoided, as, for instance, at Penrhyn and in France, but at Bangor there are better facilities for the cheaper method of open quarrying. Even the sunken quarry system is cheaper than shaft-sinking pure and simple. D. C. Davies, in his little book on "Slate and Slate Quarrying" (page 116) gives the cost of the shaft-sinking system as 50 per cent. more than that of open quarrying.

The question of space to provide for waste rock in slate-quarrying is always an important one, for the proportion of rock which goes to the spoil heap is generally a good deal more than half the gross weight quarried. Mr. H. L. Warren, in the "Mineral Industry," makes an interesting statement, as follows:—

> "It is said that one-sixth to one-twentieth is about the proportion of finished products to the total rock removed, though some quarries do better. In Wales, where the stock is more closely worked than in the United States, for they make everything at all workable into some sort of marketable product, this probably is rarely above one-eighth, and in one of the best paying quarries only 3½ tons of marketable slate are made of every hundred tons broken."

On the other hand, Prof. H. Ries, in his "Economic Geology" (page 120), states that the waste in quarrying slate is from 40 to 60 per cent. D. C. Davies, in his work cited above (page 170), assumes one-fifteenth as the average proportion of finished slate in British quarries to the quantity of rock broken.

The position of the open quarry was probably selected with reference to its proximity to the somewhat open ground close by, and the termination of the tramway from the Tamar.

The old shaft sunk on the top of the hill is said to be 256 feet deep. It is now full of water up to between 100

and 150 feet from the surface. At the east end of the deposit is an air shaft, which connects with the shaft workings.

Quality of the Slate.

In forming an opinion of the suitability and value of slate, some of the physical properties which must be taken into consideration are the following:—

(1) The slate must not be too soft and earthy, or it will resist the action of the weather imperfectly. When breathed upon, the argillaceous odour should not be strong.

(2) The capillarity should be weak. It is undesirable for the absorptive capacity to be strongly developed. To test this, leave the slate in water in an upright position for 12 hours or more, and observe how far the water rises in the unimmersed portion. Soak a piece in water for some hours, and ascertain the difference in weight before and after immersion.

(3) The cleavage must be good, and permit thin and regular splitting. Good slates can be split to a tenth of an inch or thinner. It is easier to split slates to advantage when they are not too dry; accordingly, a dry or frosty climate is less desirable for slate quarrying than one which is reasonably damp; accordingly, during dry weather, the stone as quarried has to be kept moist by the application of water.

(4) If required for electric switchboards, &c., it is important that there should be little or no magnetite present. This may be tested by grinding a sample finely and extracting any magnetic iron oxide from the powder by means of a magnet.

(5) Calcite (carbonate of lime) should be absent, otherwise it will gradually dissolve out under the influence of the weather. Its presence can easily be detected by the application of hydrochloric acid.

(6) Veinlets of quartz traversing the slate will increase the quantity going to the spoil heap, and, besides, silicify and harden the slate, often to such an extent as to make the bed not worth working.

(7) Jointed, contorted, and decomposed beds are thoroughly unsuitable. It is, however, not necessary to take the beds immediately below the subsoil as criteria. An improvement often shows itself in going down a little way.

(8) Good slates, when suspended and struck sharply with a hammer, ring with a sonorous sound.

(9) Strong slates, suspended between two fixed points, will bear the weight of a man.

From what has been said it will be seen that at Bangor the first-quality slate is not now accessible, only inferior grade being at grass, and it would not be fair to apply rigidly the various physical tests to samples which have been lying out in the soil for nearly 40 years. A strong point in favour of the quality of what may be expected is that with all this exposure, most of the slates seem to be economically sound and usable. The present post-office at Bangor was roofed with them (roughly split and in very small sizes), and excepting where they have been broken by stones mischievously thrown on the roof, their degree of durability is distinctly shown. There is evidently nothing radically wrong with the cleavage, as there are hundreds of slates lying about in the grass well and truly split, though some of them are rather thick and rough. These remnants of stock are of various grades, and are said to be inferior classes of product which were supposedly reserved from the export market, and destined to be got rid of in the local trade. It is unfortunate that the water in the workings debars inspection of the better-grade stone. The white patches on many slates which have been buried in the soil consist of carbonate of lime, but this may be looked upon as merely the result of infiltration from the surface soil, as it seems to be absent from the substance of the slate itself. Any argillaceous odour that there may have been originally has completely disappeared. The slate is free from veins of quartz, and, as far as the rock exposures show, is not spoilt by jointing. A test has been made in the Geological Survey Laboratory by Mr. W. D. Reid, Government Assayer, from which it appears that magnetite is absent, and the slabs will accordingly be suitable for electrical purposes. Some pieces were soaked in water for 12 hours without any appreciable capillary action manifesting itself, nor had they any visible absorptive capacity. The slate, on the whole, inclines to be rather soft, however, and apt to be a little flaky on weathering,

which is a blemish from a builder's point of view; but this is not always the case, and from experience gained in the shaft the hardness improves as cover is gained. In effect, all qualities are present, and the product would have to be carefully graded to be fit for the market.

Quantity of Slate Available on the Lease.

Some important factors necessary for this calculation are at present unknown, and any estimate has to be founded on assumptions which may or may not prove to be justifiable. Assuming the workable slate to be continuous to the northern boundary of the lease, and the aggregate width of the quarry faces across the slate-bearing belt as 400 feet, then from surface down to a depth of 100 feet, or a little above river-level, there ought to be, approximately, 3,000,000 tons of slate rock of one quality or another. An assumption has to be made with regard to the proportion of waste. This is impossible to establish except by actual work. If, for the purpose of illustration, the proportion of finished product to rock broken is taken as 1 in 6, the net weight of marketable slate would be 500,000 tons; or, if 1 in 10, 300,000 tons; if 1 in 20, 150,000 tons. These figures are given simply to show that as regards quantity of material there is sufficient for carrying on an enterprise of some magnitude for a lengthy period, provided the grade is satisfactory. It is said that the Melbourne company worked for three years, putting out 14 tons a day, which would be equivalent to about 12,000 tons of slate for that period, or 4000 tons per annum.

Transport of the Slate to Launceston.

In the old times a horse tramway was used to truck the output to Egg Island jetty, a distance of about 11 miles. Eventually there will be a possibility of rail transport to Bell Bay direct when the projected railway connects Karoola with that port; the railway will run close to the quarries. Another plan would be to acquire tramway easements over the lands between Bangor and Karoola. But for a beginning, the line of least resistance would be to convey the product by road to Karoola station, and thence by rail to Launceston. A metalled road exists to the station, and motor lorries could no doubt be employed on it during the dry season. During the winter months this mode of transport would cut the road up too

much to be admissible. Reckoning very little back freight from Karoola, I am informed by a competent authority that the motor expenses would be 2s. or 3s a. ton on a liberal estimate. The railway freight in truck loads to Launceston station would be 6s. per ton (or perhaps a special quote might be obtained for quantities), and 7s. a ton to the wharf. The total transport rate would therefore be from 8s. to 10s., plus handling costs.

Economics.

Reviewing the property from a commercial point of view, three questions which the promoters have to consider are:—

(1) Is the quality good enough for placing on the market?
(2) Are the working conditions favourable?
(3) Are the market prices which are available such as will enable the deposit to be worked profitably?

As regards the quality, it need not be expected that it will be equal to that of imported Welsh slate. The underground workings ought first of all to be unwatered in order to obtain absolutely accurate information as to the quality of the deposit where operations ceased. There is evidence to show that the product was marketed in the past, and it is said that the grade of the output of the last company was superior to that of the first one, as deeper ground was worked in the heart of the slate body. The keynote of success will probably be cheap mining and judicious selection and grading. Just what proportion of rejects there will be can, as in slate quarries generally, be ascertained only in the course of working. The reports show that some of the slate has good standing properties; and similar evidence is to some extent furnished by the numerous second or third grade slates which have been left over on the spot from the old work. The irregular quality of many of these points to difficulty in splitting. In actual work the utmost care must be exercised in grading the product, so that nothing is marketed which will reflect discredit on the brand. The deep shaft indicates that the previous owners found it necessary to sink to that depth in order to obtain good slate; and this shows the nature of the problem which confronts new investors.

The general conditions are favourable, in that the quarries are close to two perennial streams, and connected by

road and rail with a shipping port within a comparatively short distance, and the freight to port will not be excessive. The deposit forms a hill ridge rising from the flat country to a height of beween 100 and 140 feet, and is, accordingly, amenable to open quarry working for a height of nearly 100 feet. It will be necessary to discover how the good-quality slate occurs; *i.e.*, whether there are definite belts or bands of it, and at what distance apart; also (and in view of economical working this is important) whether the harder grade can be relied upon above, say, the 100-feet level, or whether it would have to be raised from expensive deep workings. These are important factors of the proposition. The owners will need the best technical advice on these points, so as to confine work to a depth which will not be too costly. If it is necessary to go down a little deeper than adit-level (but not much) it is possible that the cost may not prove prohibitive, considering the high prices now ruling. Possibly the same result may be obtained by extending the quarries further into the hill, and gaining slightly more cover, but the increase of cover will not be great, as the surface of the hill ridge is somewhat flat.

As regards markets, until actual sales are made, it is difficult to know what prices are likely to be maintained. The pre-war rates for imported slates of standard size (20" × 10") were £14 or £15 per ton, but that price is now doubled. Stable figures are, in fact, non-existent for the present, but it is satisfactory to learn from the promoters that purchasers are prepared to take delivery of any slates produced.

Besides roofing slates, the manufacture of slate slabs is an important item in a slate enterprise. For this purpose blocks of hard or massive slate, not well adapted for splitting, are utilised. They are planed and cut by sawing-machines as required, and, if necessary, ground and polished for special uses. They make good mantelpieces, cisterns, flooring for dairies, window-sills, door-steps, &c. A use for which they are well adapted is for feeding-troughs on farms, and they are much esteemed for that purpose on account of their cleanliness. Generally a good proportion of the total output of a quarry consists of these slab blocks. A good demand for Bangor slabs could no doubt be easily created.

From a general examination, it looks as if in the present circumstances a favourable time has arrived for making some attempt to investigate the proposition, with a

view of establishing values and determining what working methods could be adopted. There exists now an intense demand for roofing material, and there appears to be at Bangor the possibility of introducing to the public a much-needed article of Tasmanian manufacture.

North Bangor Slate Quarries.

One mile and a half north-west of the Bangor quarries is a mineral lease taken up by W. Hammersley, 7693-M, 40 acres, on the west bank of Piper's River. An old quarry is situate at the base of the steep hill near the river. This is known as Just's quarry, being on land which was formerly owned by T. C. Just. The works here are said to have been in existence before the first quarry at Bangor was opened. It has been opened to show a height of about 30 feet, and is about 20 feet above the river-level. The slate is in massive blocks, and dips south-west at an angle of 15 degrees. It is, as a rule, somewhat hard, and then splits with some degree of unevenness. Some nice well-preserved slates still lie in the grass, left by the old workers. The slate has a better reputation than that at Bangor; and as for any defects in its cleavability, it is said that there were no skilled splitters in those days, but only unskilled workers, called "slaters." Some of these slates are of excellent quality, and would easily command good prices.

About 3 chains south-south-east of the preceding is Just's tunnel, which is just outside the 40 acres, and in the railway reserve on G. W. Freeman's 100 acres. It has been driven about 400 feet south-westerly into the hill which skirts the river.

Some large slabs were taken from Just's quarry for special uses. Two of these were sent to Launceston for a billiard-table, but were used in the "Cornwall Chronicle" office (afterwards the "Daily Telegraph" office) as what are called in the printing trade "imposing surfaces," where they are still in active use and good condition this day. Through the good offices of Mr. Jno. Gunning, the editor, an opportunity has been afforded of inspecting these slabs, which measure 5′ × 3′ × 1″, and occasionally carry weights of several hundredweights.

At McKenna's bend some hard black slate is exposed in a creek at the foot of the hill. It is plentifully charged with pyrite, and splits in large leaves.

There would seem to be insufficient warrant for two independent slate enterprises in the district, at any rate, at present; but it would be a pity for some of the good slate on Hammersley's section not to be utilised. It is, however, possible that the Bangor undertaking might make some use of these northern occurrences to satisfy special demands of the market.

On G. W. Freeman's land a small excavation has been opened, exposing some clean black slate. It is, however, too hard to admit of being worked advantageously or used for ordinary market purposes. It is a very dense compact stone, and would be of use for road-metalling.

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V.—GOLD-BEARING REEFS AT NORTH BANGOR.

In the northern part of the Bangor district the slate beds are traversed by veins of auriferous quartz. These beds are a part of the Back Creek and Lefroy auriferous belt. In the central part of the Bangor district, the slates are less mineralised, but here they are more indurated, and veins and veinlets of quartz are fairly numerous. The region was prospected for gold at an early date, but while gold has certainly been obtained from alluvial and surface detritus, no real mine has been opened up.

Examinations on this visit were confined to a small mine opening on R. McKenna's 91 acres, a mile and a half north-west of the Bangor slate quarry, and to some occurrences on G. W. Freeman's 100 acres.

McKenna's Tunnel.

Near the southern boundary of McKenna's land, at the foot of a steep hill which descends to the river, a short drive has been put in for about 30 feet in slate country in a north-west direction, showing a small quartz-reef, containing much graphite and pyrite, and a little gold and silver. The width of the reef as seen at the outcrop is about 10 inches, but below the water, which now impedes examination, it is said to widen out to between 3 and 4 feet. The present drive has been started only 6 feet above the present level of the river, and water trouble must be expected if any deeper work is done here.

Samples taken from here have been assayed by Mr. W. D. Reid, Government Assayer, in the Geological Survey Laboratory, and have yielded the following results:—

Gold—1 dwt. 10 gr. per ton.
Silver—5 dwt. 15 gr. per ton.

The excess of silver indicates the sulphides in the vein as the source of the precious metals, and the main return in working would probably be derived from the concentrates. The broken nature of the slate near the lode, and the occurrence of graphite, together with a little copper pyrites, may be considered as furnishing favourable indications. A little more work might perhaps be done when opportunity offers, but caution is advisable, for the probability is that

there is only just enough gold in the vein to tempt an outlay which will prove unprofitable. The gold contents will have to increase very much before anything payable can be said to exist, and the chances of much increase are extremely doubtful.

Freeman's Trenches.

A long line of trenches has been cut on G. W. Freeman's land, to the west of McKenna's property. Some of these have yielded vein quartz (hard, white, with rusty patches), and also lumps of graphite, altogether a congenial matrix for gold. Samples taken have been assayed by the Government Assayer, and have yielded:—

Gold—2 dwt. 3 gr. per ton.
Silver—4 dwt. 11 gr. per ton.

The impression gained from an inspection of the work done is that a line exists here which may well yield a little gold, but that the prospects of any body of quartz which can be worked profitably are slender. Small veins and stringers are indicated, just sufficiently auriferous to lead to expenditure, for which the return will be inadequate.

It is said that when this was Crown land some prospecting was carried on, about 29 years ago, and a few pits were sunk in alluvial, without much result.

On the whole, the outlook for payable gold at Bangor is not bright. Further prospecting is desirable before laying out much money at the points where quartz has been located.

VI.—OIL SHALE.

About halfway between Bangor and Karoola, or 2 miles from either place, is an occurrence of oil shale, which crops out on the top of a hill rising from the main-road on the lot, 68¼ acres, charted in the name of T. Windsor, and now occupied by Mr. Cornelius Macarthey. The strat exposed from the base to the summit of the hill are mudstones and mudstone shales belonging to the Permo-Carboniferous system.

On the west side of the hill, near the summit, is a small cut, exposed for about 6 feet of driving in a north-east direction. The floor is covered with clay, which has fallen from the roof, and this prevented the examination of the seam on the present visit. With its associated bands, the seam may perhaps be about 18 inches thick, and dipping slightly into the hill. A few slabs of shale are scattered on the grass about the entrance. Until the cut is cleared of mullock, the actual thickness of the solid seam cannot be determined. The probability is that there are a few thin layers of shale with intervening clay. We are here about 300 feet above the road.

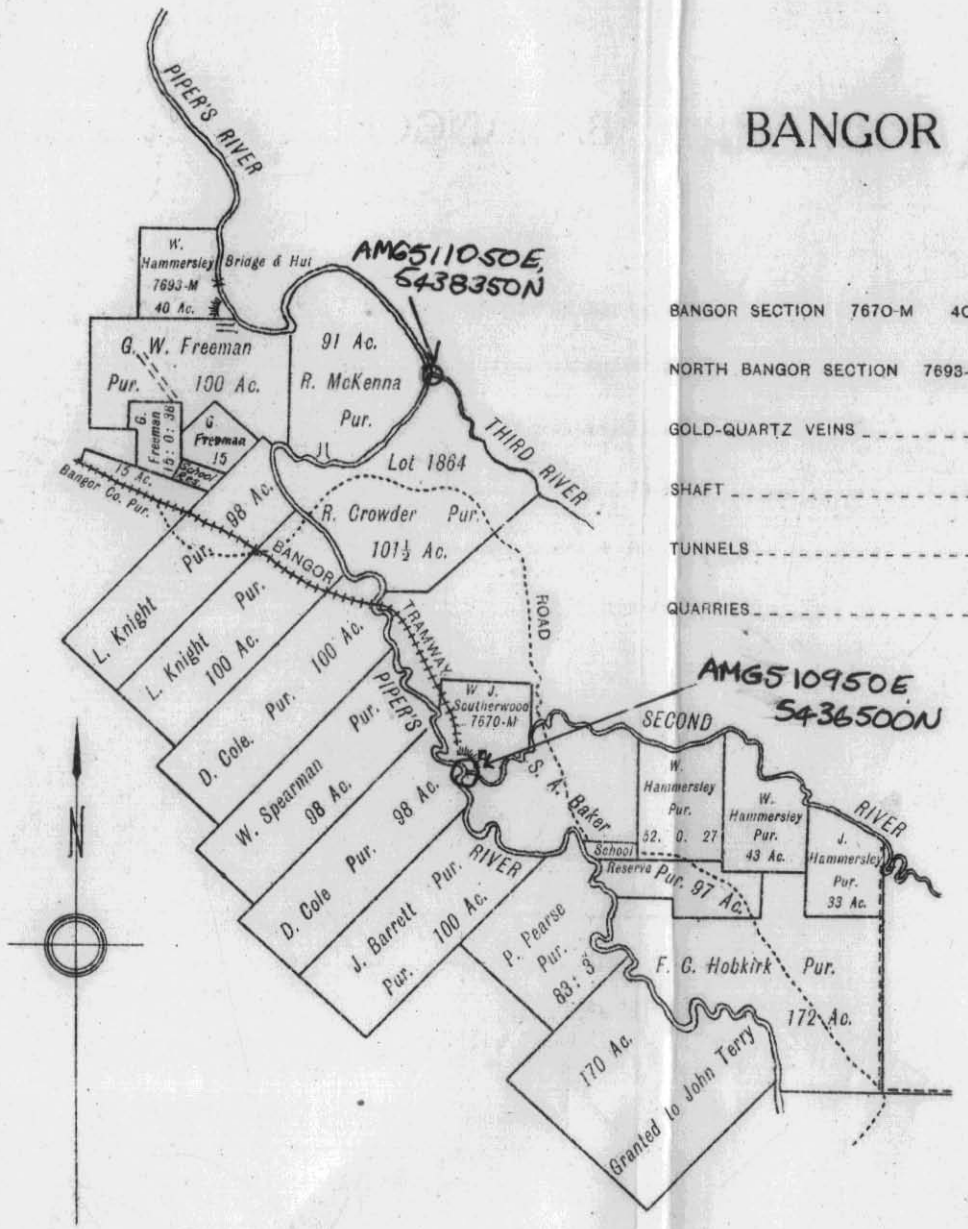
The shale is a black carbonaceous variety, impure and heavy; about 50 per cent. of it is inert, non-combustible material. Its colour is a dull black. It is sectile; that is, it can be easily cut with a knife, but not sufficiently so to yield shavings. It weathers with a light brown crust. It is not inflammable with a lighted match, but when heated its smoke emits a tarry odour.

Some preliminary tests have been carried out on samples of this shale by Mr. D. M. Griffin, manager of the Railton-Latrobe Shale Oil Works, and he has kindly communicated the analytical results which have so far been obtained, namely:—

Crude oil—19·7 gallons per ton (2240 lb.).
Ammoniacal water—14·0 gallons per ton.
Permanent gas—2000 cubic feet per ton.

Mr. Griffin states:—"The crude oil is of a paraffin base, semi-solid at 62 deg. Fah., dark-green by reflected light and red by transmitted light, odour not unpleasant, and has a specific gravity of ·920 at 60 degrees Fahr. The above products were not further examined, as the known quantity of shale was considered to be too small to allow of profitable development."

BANGOR SLATE LEASES



LEGEND

BANGOR SECTION 7670-M 40 Ac. W. J. SOUTHERWOOD

NORTH BANGOR SECTION 7693-M 40 Ac. W. HAMMERSLEY

GOLD-QUARTZ VEINS

SHAFT

TUNNELS

QUARRIES

W. H. Twelvetrees
Government Geologist
March, 1918

AMG REFERENCE POINTS ADDED

5 cm

Photo. Mounted by John Vail, Government Printer, Hobart, Tasmania

As will be seen from the above the oil yield is low. Shales are worked in Scotland with still lower yields, but only because the ammonia content is high enough to make them valuable for the production of ammonia sulphate.

The shale has been examined in the Geological Survey Laboratory, and the following results have been obtained:—

	Per cent.
Moisture at 100 deg. C.	0·80
Volatile combustible matter ...	27·80
Fixed carbon	21·30
Ash	50·10
Total	100·00

Fifteen gallons of crude oil were extracted by distillation.

The work done up to the present does not admit of an opinion being formed as to the extent and size of the seam, its behaviour, or its real trend. What is required is—(1) to open further on the outcrop at the present site; and (2) to trench deeply on the slope on the east side of the hill, especially towards its base, so as to ascertain whether the seam crops out at surface on that side or plunges deeper into the lower ground on the other side of the fence. If it is found at surface, there will be very little workable area on the dip in this hill. An attempt might then be made to trace the level course of the seam on the adjoining timbered hill.

W. H. TWELVETREES, Government Geologist.

Launceston, 28th March, 1918.