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REPORT ON SHALE DEPOSITS IN TASMANIA.

1. *Tasmanite Shale.*—The oil shale of the Mersey district, which was formerly called dysodile, occurs associated with coal-measure sandstones in the Latrobe area in the basin of the River Mersey. It seems to have been recorded first in 1852, when it was reported to the Royal Society of Tasmania. The first analysis of it was made by Professor Penny, of Glasgow, who reported as follows :—

Resinous matter	26·04
Sand and clay	69·83
Pyrites	2·76
Water	1·37
	100·00

He also stated a proximate analysis as follows :—

Volatile matter	20·41
Fixed carbon	5·50
Ash	71·20
Sulphur	0·73
Water	2·16
	100·00

In 1861, Mr. Charles Gould reported officially that the coal measure beds are permeated by the resinous particles of the substance, and he referred to this as dysodile; but Professor A. H. Church, in 1864, gave the shale the name of tasmanite.

In 1876, Mr. E. T. Newton proposed the name tasmanite for the shale, and Tasmanites punctatus for the spores (or plants to which they belong). The size and form of the seed-like bodies or sacs were considered by him to indicate that they are more nearly allied to Lycopodiaceous macrospores than to anything else.

E. A. Newell Arber (Catalogue of the Fossil Plants of the Glossopteris flora, Brit. Museum, p. 176) in 1905 regarded it as hardly necessary to retain the name Tasmanites punctatus. He says there is no doubt that they are of the nature of spores, although of what particular type of plant there is no evidence to show. They can, however, hardly be of Lycopodean origin, since lycopods are unknown at present from Australasia in association with the Glassopteris fauna.

The layers of shale wear the aspect of a light-brown or yellowish brown sandstone, charged with minute resinous-looking flattened discs. Marine Permo-Carboniferous fossils (Spirifera, Productus, Aviculopecten, Cardiamorpha, Pachydomus, Platyschima, Pleuretomaria, Pteronites) are recorded from the beds. They are just below the Tasmanian upper marine Permo-Carboniferous beds, and correspond approximately with the Mersey coal measures, though their precise relations with the

known coal seams in this basin have not yet been settled. The neighbouring coal seams probably lie beneath them.

The known shale area comprises a strip of country about 6 miles long by 2 miles wide, lying to the east of the railway-line, between Railton and Latrobe. One thousand three hundred and five acres of this are held at present for shale-mining, and 931 acres formerly held are at present vacant. About a square mile has been proved by shafts. At the southern end of the field, north of Railton, 899 acres are held in the name of F. E. Hedditch, where, apart from two small upper seams of inferior quality, a 4-ft. seam of good quality has been proved at a depth of 28 feet from the surface. At the northern end of the area, about a couple of miles south of Latrobe, 406 acres are held, in the name of G. T. Bastard.

The Mersey River has intersected the shale area, and at one place a bed shows in the bank for a thickness of 6 or 7 feet. An outcrop has also been noticed up to 9 feet in thickness. Several of the exposures are at different levels, and are considered to belong to more than one seam. At many points the beds can be worked by open-cut; and where underground mining is necessary, drainage will be easy, as the beds are higher than the river. It is probable that the area in which the shale beds occur is more extensive than is at present known. It is intended to have a departmental examination of the district made shortly.

In 1902 the Tasmanian Shale and Oil Syndicate, originating in South Australia, caused some exhaustive experiments to be made by Dr. J. G. A. Black, M.A., and Mr. T. Esdaile. The sulphur and refractory bitumens contained in the shale were removed in the experiments without difficulty, and were declared as forming no obstacle to the successful extraction of the oil. Dr. Black reported results from various outcrops as from 44 to 65 gallons of crude oil per ton. Mr. Esdaile says that the tests indicate an average richness of 60·2 gallons of oil per ton of shale, sp. gr. 0·931. He states that the specific gravity of the crude oil is about ·932, as against ·892 of the parallel oil of the Scotch shales.

The following tabular statement of oil products obtained by testing 144 ozs. (troy) of crude oil, equal to about 39¼ lbs. of good shale, by Esdaile's No. 2 method has been published, and will show the nature of the oils which can be extracted from the Mersey shale :—

Product.	Weight in troy, ozs. grs.	Fraction of gallon of product.	Temperature of steam distillation.	Specific gravity at 20 deg. Cent.	Flashing temperature, degrees Fahr	Firing temperature, degrees Fahr.	Gallons per ton of 2240 lbs.
Gasoline or heavy benzine ..	12·390	·1128	up to 115C.	·779	Fires at once	Ordinary temperature	6·429
Light burning oil (photogene)	12·270	·1115	up to 140C.	·834	88° F.	120° F.	6·355
Heavy burning or lighthouse oil	6·600	·0496	140 to 160C	·846	140° F.	161° F.	2·827
No. 1 light lubricating oil ..	8·700	·0642	160 to 180C.	·870	180° F.	225° F.	3·659
No. 2 ditto ditto	11·360	·0882	180 to 200C.	·914	250° F.	272° F.	5·027
No. 3 ditto ditto	3·310	·0230	200 to 220C.	·90	260° F.	283° F.	1·311
No. 1 medium lubribating oil	11·250	·0855	220 to 240C.	·924	272° F.	290° F.	4·873
No. 2 ditto ditto	6·000	·0433	240 to 270C.	·947	310° F.	351° F.	2·468
No. 3 ditto ditto	6·000	·0429	300C.	·966	371° F.	398° F.	2·445
	79·270	·6210					35·394

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The analyses which were made in the Black and Esdaile experiments show 64 per cent. lubricating oil, 25 per cent. lighting oil, and 11 per cent. benzine and benzoline. The richness of the shale (1 ton of it yielding as much crude oil in these experiments as 2½ tons of Scotch shale), combined with the low mining costs (1s. 6d. to 2s. per ton of shale, equal to 6s. to 10s. per ton of crude oil) and proximity to port, indicate conditions favourable to a successful enterprise, provided that an extraction method involving moderate working costs can be applied.

2. *Kerosene Shale or Cannel Coal.*—About 16 miles south of Wynyard, an outcrop line of coal seams stretches for about 2 miles north-east and south-west, between the Jessie and Flowerdale rivers, in the Parish of Preolenna. The seams are in a series of sandstones and clays, approximately 250 feet thick, which are known as the lower coal measures of the Permo-Carboniferous system in Tasmania. One of these seams is 20 inches in thickness, and is made up of kerosene shale 6 inches, bright coal 9 inches, splint (?) coal 5 inches. The shale is black; has a pitchy lustre, conchoidal fracture, and is characteristically tough and sextile. Samples assayed in the Tasmanian Government laboratories yielded the following results :—

	Fixed Carbon.	Gases, &c.	Ash.	Moisture.
No. 1	21·0	76·2	2·3	0·5
No. 2	23·2	71·6	4·1	1·1

Samples have also been assayed in the New South Wales Government laboratory, and yielded results as under :—

No. 3	28·51	67·32	2·92	1·25

The Launceston Gas Company tested the illuminating power of the gas yielded by the Preolenna shale, which proved to be about double that of Greta coal. The result extended beyond the limit of the photometer scale used, and was estimated as approximately 40 candle-power per gas referee's burner. The extent over which this seam exists has not been proved by boring or mining work. The shale is only known at two points, but the coalfield has an approximate area of 2 miles by 1 mile. The distance from the nearest port (Wynyard) is too great to allow these seams to be worked profitably until the transport question is settled by the construction of a tramway-line from the coast. Parliamentary sanction has been given for a survey of a line from Burnie to Flowerdale, and, when further facilities exist in this direction a working programme will be brought within the range of profitable discussion. The substance, strictly speaking, appears to be neither shale nor cannel, but is rather intermediate between the shale-cannel group and bituminous coal, and would probably produce benzenes rather than oils.

Barn Bluff.—A somewhat similar coal to the preceding exists in fragments near Barn Bluff, 45 miles from the north coast. The seam from which the pieces have been derived has not been located, but it doubtless exists somewhere in the vicinity. Mr. W. A. Dixon, of the Technical College Labora-

tory, Sydney, considered that it would yield far more tar than oils, which would be difficult to purify. He says, "It is not a cannel from which oils are not made, and not a shale from which they are."

The proximate analyses which have been made of this coal at different times are the following :—

	1	2	3	4	5
Analyst	J. Sharpe, Ballarat.	W.F.Ward, Hobart.	J.C.Newbery, Melbourne.	W.A Dixon, Sydney.	Average analysis.
Water	0·30	0·4	trace	none	0·2
Ash	2·80	4·2	6·05	4·12	4·3
Volatile Hydro-carbons	55·00	51·1	54·20	50·86	52·8
Fixed Carbon ...	41·90	44·3	39·75	43·69	42·4
Sulphur	trace	0·8	not determined	1·33	0·7

In Petterd's Catalogue of the Minerals of Tasmania, the name "Pelionite" is suggested for this variety.

Mr. W. F. Ward, the Government Analyst, obtained 92 gallons of crude oil and tar per ton by very slow distillation; but no investigation has yet been made in the direction of establishing the commercial value of the substance as an oil producer.

W. H. TWELVETREES, Government Geologist.