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(No. 46.)

TASMANIA

REPORT

OF THE

DIRECTOR OF MINES

FOR

YEAR ENDED 31ST DECEMBER

1945

Presented to both Houses of Parliament by His Excellency's Command.

TASMANIA:
H. H. PIMBLETT, GOVERNMENT PRINTER, HOBART

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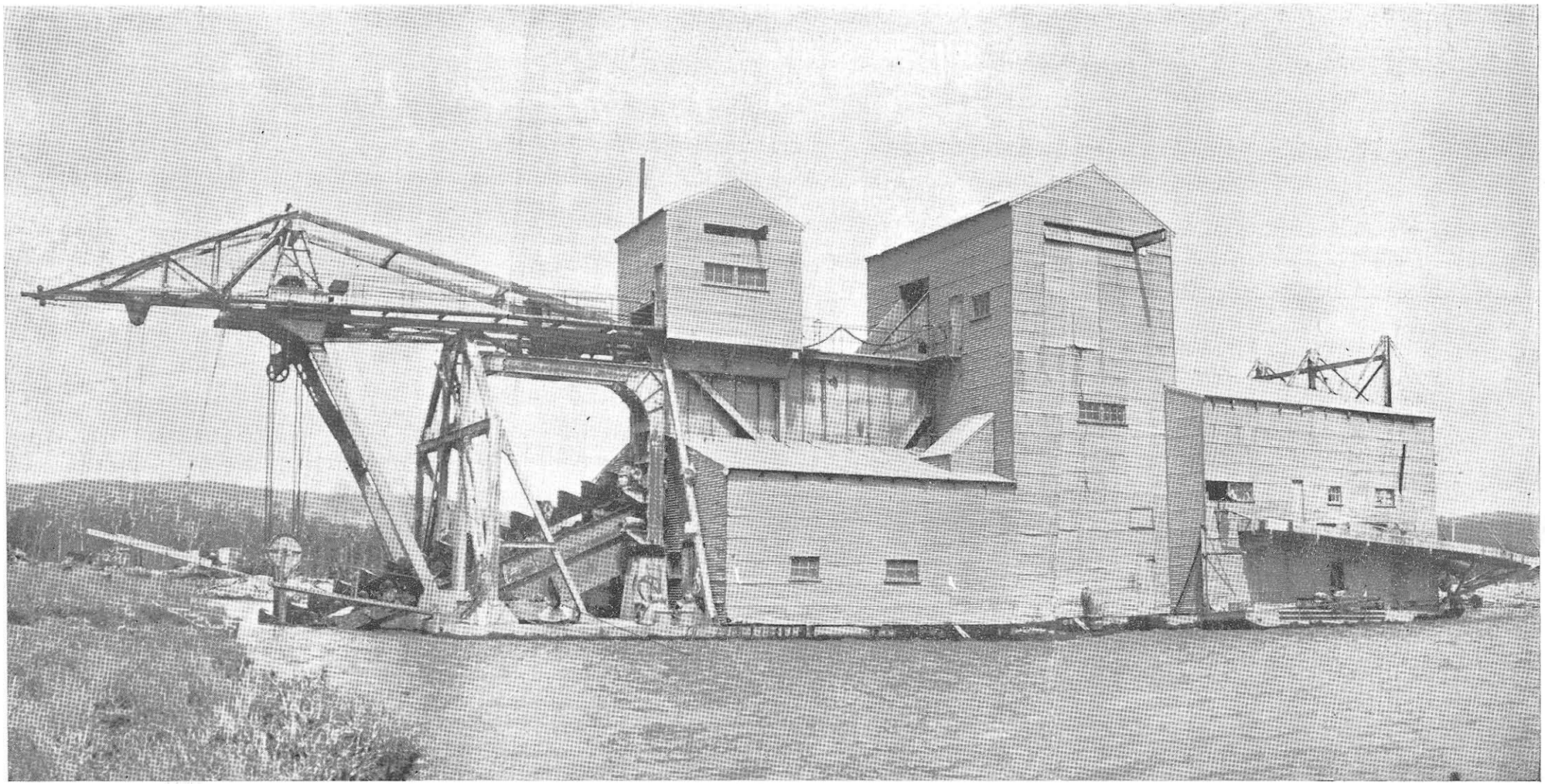

DORSET TIN DREDGE—COMMONWEALTH MINERALS PRODUCTION DIRECTORATE.

DORSET FLAT—South Mount Cameron.

THROUGHPUT—1,590,700 cubic yards alluvial ground.

RECOVERY—135·54 tons concentrate containing 97·97 tons metallic tin and 252·96 oz. gold.

REPORT OF THE DIRECTOR OF MINES.

Department of Mines,
Hobart.

SIR,

I HAVE the honour to present my report on the mining industry of the State for the year ended on the 31st December, 1945.

Mineral Production

The total value, in Australian currency, of the output of minerals and mineral products was £2,622,806, as compared with £3,066,245 for the previous year, representing a decrease of £443,439.

Sharp declines were recorded in the production of copper, lead, silver and zinc, but a completion of major developmental programmes resulted in a substantial improvement in the output of scheelite and steadied the declining production of tin.

The combined output of carbide, cement, and limestone was less and there was a decrease in the output of gold, cadmium and ochre, but there was an increase in the production of asbestos, bismuth, kaolin, pyrites, osmiridium, silica, and talc.

Coal mining continued to be characterised by freedom from industrial stoppages and a new high-level production of 149,077 tons resulted.

The number of men employed in mining, quarrying, and metallurgical operations was 5178, as compared with 5439 for the previous year. Diversions of labour to other industries was of serious moment to developmental activities in mining and productive operations were retarded at several mines in consequence.

The Electrolytic Zinc Company of Australasia Limited was in continuous operation at Risdon processing zinciferous calcines imported from the mainland and arising from the calcining of concentrates recovered from the selective treatment of Tasmanian ores. Production from imported calcines was 65,263 tons of zinc, valued at £1,501,049; 190·87 tons of cadmium, valued at £85,370; and 13·67 tons of cobalt oxide, valued at £6291. Calcines actually processed from Tasmanian ores returned 18,510 tons of slab zinc, 38·2 tons of cadmium, 765 tons of lead, 113,530 oz. of silver, and 0·25 ton of cobalt oxide. An average number of 1555 men was employed at these works.

The Tasmanian ores resulted from continued exploitation of the extensive occurrences of zinc-lead sulphides at the Rosebery and Hercules mines, on the West Coast, where an average of 386 men was employed in mining, milling, and calcining operations. The combined quantity of ore mined was 108,806 tons. Selective flotation resulted in the recovery of 32,657 tons of zinc concentrates, 6902 tons of lead concentrates and 3097 tons of copper concentrates. The recoverable quantity of metallics was fixed at 15,609·34 tons of zinc, 5137·44 tons of lead, 275·5 tons of copper, 29·58 tons of cadmium, 7478·67 oz. of gold, and 655,535 oz. of silver. The lead concentrates were exported and the zinc concentrates were calcined at Zeehan and despatched to Risdon for processing.

The Mount Lyell Mining and Railway Company Limited continued to function as the major producer of copper. The ouput of crude ore from surface and underground mining was 1,469,170 tons, being 10,892 tons less than for the previous year. Underground mining was less active, the quantity of ore raised being 78,133 tons. The greatest output from productive sections was 1,391,037 tons from the West Lyell open cut workings. A shortage of labour continued to retard mining operations.

At the concentration plant, 1,464,446 tons of ore was processed for a selective recovery of 32,396 tons of copper-sulphide concentrate and 44,928 tons of iron-pyrite concentrate. The copper concentrate, together with 4684 tons of high-grade ore and a quantity of copper precipitate extracted from mine waters, was smelted for a recovery of 7246 tons of blister copper.

Normal operations at the refinery resulted in an output of 7179 tons of electrolytic copper, and the cell residue returned 4853 oz. of gold and 24,232 oz. of silver.

Of the iron-pyrite concentrate, recovered by selective flotation of low-grade ores, 40,168 tons were exported to the mainland for use in the manufacture of fertilisers.

Diamond drilling was continued in the definition of ore zones, and reserves were appreciated to include a large volume of lower grade ore. In September, ore reserves were assessed at 36,547,000 tons of an assay value of 0·76 per cent copper, 0·05 oz. silver, 0·008 oz. of gold per ton. Activities have been characterised by progressive advances in mining and metallurgical practices as applied to the handling of large volumes of low-grade ores, and innovations are planned with the object of advancing the average daily output of ore from 4200 tons to 5000 tons and, later, to 6000 tons.

Marketing disabilities, labour depletions, and restrictive controls continued to gravely retard the development and mining of silver-lead and zinc-lead ores. The output of lead receded to 6298·44 tons and represented a sharp decline from the peak production of 13,550·85 tons in 1940. The capacity-production of operating mines was greater than the recorded output and possible producers remained idle. Positive results accrued from endeavours to restore markets and secure improved metal prices and it is expected that, as labour and equipment become available, planned programmes of exploration and development will be inaugurated and a forward move made in the rehabilitation of silver-lead mining.

Operations by the Electrolytic Zinc Company at the Rosebery and Hercules mines accounted for the greater portion of the output of lead. The Farrell Mining Company, Tullah, maintained an overseas market, but the through-put of ore declined to 7116 tons owing to the labour shortage.

Ore treatment resulted in the recovery of 1620 tons of concentrate, containing 1161 tons of lead and 136,390 oz. of silver. Available labour was employed in planned exploration below the productive workings and in the southern section of the mine, and prospects of new ore developments were materially enhanced.

Metallic tin in the product from lode and alluvial mining was 801·239 tons, valued at £240,369 sterling. Diversions of labour, local impoverishments, and delayed programmes of development reduced normal production at several mines, but the implementation of modern bucket dredging at Dorset Flat steadied the overall production, which has declined since 1940, when an output of 1430 tons was recorded.

Aberfoyle Tin N.L., operating on a multiple lode series; Renison Associated and Mount Bischoff mines, mining and milling tin-pyrite ores; Briseis Consolidated, sluicing a deep lead; and Dorset Tin Dredge, operating on river flats, were the principal producers and contributed 648·438 tons to the total output of metallic tin.

Hydraulic mining was continued by Goshen Tin Mines N.L. on areas of alluvial ground at St. Helens, the Endurance Tin Mining Company was engaged in sluicing shallow ground and in transferring plant to a new location, and underground mining was continued on the wolfram-tin lodes at Storey's Creek Mine. The output of concentrate from these operations contained 71·005 tons of metallic tin.

Small mines, miscellaneous parties, and individual operators contined to be engaged on alluvial, lode, and granitic occurrences throughout the State. These activities were of collective importance in tin-mining, the output of tin-oxide containing 71·79 tons of metallic tin.

Operations by Briseis Consolidated were characterised by the removal of 271,000 cubic yards of basaltic overburden and the sluicing of 790,000 cubic yards of drift for a recovery of 232·9 tons of tin-oxide, containing 167·68 tons of metallic tin.

The Endurance Tin Mining Company was mainly concerned with a transference of the electric barge and sluicing plant to a new location at the Clifton workings but 29·28 tons of concentrate, containing 21·55 tons of metallic tin and 6·9 oz. of gold, was recovered from the sluicing of shallow ground.

The modern bucket dredge, installed by Commonwealth Minerals Production Directorate, was in continuous operation at Dorset Flat and treated 1,590,700 cubic yards of alluvial ground for a recovery of 135·54 tons of concentrate, containing 97·97 tons of metallic tin and 252·96 oz. of gold. The installation and operation of this dredge was a major factor in arrestng the declining output of tin.

The completion of a new milling plant was the main feature of the progressive policy of Aberfoyle Tin N. L. in mining the multiple lode series at Rossarden. Mine development, on lower levels, was hampered by a lag in delivery of pumping equipment and ore production accrued from operations above No. 4 level. The quantity of ore mined and milled was 20,213 tons. Concentrates sold were 343·466 tons of tin-oxide, containing 244·719 tons of metallic tin, and 60·293 tons of wolfram.

Commonwealth Minerals Production Directorate continued with operations at the Mount Bischoff Tin Mine but low milling recoveries were adverse to profitable working. Reconstruction of mining and milling practices, as the only alternative to a cessation of operations, is to be proceeded with, as a Commonwealth-State project, to determine if recoveries can be stepped-up to provide an economic balance and thereby extend the life of the mine. The township of Waratah is dependent upon the continued working of this mine.

A progressive policy was pursued by Renison Associated Tin Mines in the mining and milling of tin-pyrite ores at Renison Bell. The Battery lode responded well to development and profitable operations resulted. Milling innovations were continued and the final plant assemblage will provide for an increased through-put of ore and an improved effective recovery of tin-oxide. A shortage of labour hampered operations. The Company is to proceed with a housing and community welfare programme.

There were material developments in the mining of tungsten ores and the combined output of wolfram and scheelite concentrates was 464·562 tons in excess of that for the previous year.

Implementation of a planned programme of reconstruction of mining and milling practices at the King Island Scheelite Mine, was attended with an increase in the through-put of ore from 3260 tons to 94,100 tons and an incline in the output of scheelite from 32 tons to 527·54 tons. The policy of the Company has been progressive and, consistent with stable markets and prices, large-scale production should continue profitably.

Shortage of labour and equipment lags retarded development at the Storey's Creek Tin Mine and anticipated progress was not made with the sinking of a new main shaft and the installation of a new milling plant. Wolfram was the main consideration and mining was centred upon the wolfram-tin members of the lode series. Ore mined and milled was 11,333 tons and resulted in the recovery of 148·3 tons of wolfram and 21·5 tons of tin concentrates.

The balance of the output of 211·11 tons of wolfram accrued from operations at small mines at Gipp Creek and in the Moina district but no major development attended these operations.

The output of gold was largely governed by activities in base-metal mining and as there was a reduction in the production of relevant base metals the output of gold receded from 16,653·38 oz. to 13,049·804 oz.

Operations, by the Electrolytic Zinc Company, on zinc-lead ores at the Rosebery and Hercules mines accounted for 7478 oz., and 4853 oz. were extracted from copper ores mined by the Mount Lyell Company. The balance of the output resulted from the cyanidation of battery tailings, treatment of tin concentrates recovered from the mining of gold-bearing stanniferous alluvials and from miscellaneous operations on auriferous alluvials.

The market price of osmiridium remained constant at £A30·65 per oz., with a net available price of £A28·28 per oz. to the producer. The recorded production increased from 107·02 oz. to 108·75 oz. Adamsfield was the principal field of activities, the osmiridium workings in the Waratah district being practically deserted. On the former field, two gravity plants and a small number of ground sluicers were in operation and interest was revived in the lode formation, but there were no developments of major importance.

The Australian Commonwealth Carbide Company at Electrona, the Goliath Portland Cement Company at Railton, and the Broken Hill Proprietary Company Limited at the Melrose Quarries continued as the principal producers of calcium carbide, cement and limestone. The total output of combined products was 107,452 tons, valued at £273,588 as compared with 166,647 tons, valued at £404,219, for the previous year. There was a decrease of 4946 tons in the output of calcium carbide and a reduction of 41,348 tons in the quantity of limestone exported for the iron and steel industry due largely to the labour shortage. Production of cement was 3872 tons less than for the previous year.

The Australian Commonwealth Carbide Company used products from the mineral resources of the State in the manufacture of 64·5 tons of calcium silicide, valued at £7224 and 1314 tons of ferro-silicon, valued at £50,580.

The potential resources of asbestos, bauxite, kaolin, limestone, ochre, silica and other members of the group of non-metallic minerals continued to attract attention for established and new industries.

Kaolin, other than clay used in the manufacture of bricks and earthenwares, continued to be produced in increasing quantities for State industries, including the manufacture of paper. The quantity marketed was 1524·75 tons greater than that for the previous year. A degritting plant was installed at Surges Bay for the beneficiation of crude product and the clay resources were more closely examined in anticipation of increasing demands.

Small quantities of ochre were mined and exported.

Mining was continued on the asbestos-bearing serpentines in the Zeehan district and 276·36 tons of marketable fibre was produced, but the grade of the deposit was not maintained and an early cessation of operations is expected.

The output of silica for metallurgical and manufacturing industries increased to 7939 tons.

Talc mining was more active, 152·75 tons being produced from a deposit at Gawler and exported to the Mainland.

A revival of interest in the natural stone industry followed an easing of restrictions in enterprises capable of utilising ornamental stone. The red granite at Coles Bay is particularly attractive for building and ornamental purposes and initial arrangements were made for a resumption of quarrying in order that export may be commenced when shipping becomes available for transport for the quarries. Endeavours are being made to induce interest in the development of the serpentines at Beaconsfield for terrazzo and other ornamental work.

Restricted importations of mainland coals continued to produce a better appreciation of the suitability of local coals for fuel requirements and an adaptation of furnace designs to coal types portends further expansion in the development and production of Tasmanian coals. The recorded output of 149,077 tons was a material advance in the production for any previous year.

The Cornwall Coal Company continued as the major producer and operations at three collieries resulted in a total output of 106,493 tons. Pillar extraction, bord and pillar work, and developmental operations resulted in an output of 83,253 tons at the Cornwall Colliery, whilst 21,790 tons accrued from mechanised coal-winning at the Mount Nicholas Coal Mine. The Company opened up a new mine, the Duncan Colliery, on a seam of average quality at Fingal and produced 1450 tons of coal.

The output of coal receded to 14,166 tons at the Jubilee Colliery. An arc-wall coal cutter was installed and commissioned but there was no improvement in overall production per person employed. Faulty seam conditions retarded machine work and the extent to which mechanisation will benefit production will be demonstrated by the degree of co-operation evinced by employees when settled seam conditions are encountered.

Roof subsidences, attending the longwall method of mining, impaired development work at the Stanhope Coal Mine and production was confined to the eastern section where the bord and pillar system of mining had been restored. Operations resulted in an output of 7822 tons of coal and afforded employment for 20 men.

The Merrywood Coal Mine was developed to the production stage and 2090 tons of coal was marketed.

The Langloh Coal Mine at Hamilton was progressively developed and the output increased to 9431 tons, 26 men being employed. The coal is of good quality and finds a ready market for domestic and regular steaming purposes.

The balances of the output of coal accrued from operations at small collieries in the eastern, southern and north-western districts but there were no new developments in connection with these activities.

Developmental and productive operations are reviewed in detail by district inspectors in the appended reports.

Aluminium.

The Commonwealth-State project for the production of ingot aluminium in Tasmania has rested with the Commission set up to control the industry. Collaterally with an investigation of metallurgical processes throughout the world, to ascertain the process most suitable for adoption, a planned programme of work was commenced on deposits of bauxite in the State, to determine volumes and grades and the economic suitability of the ore for the alumina extraction process. Deposits at Ouse were placed under initial investigation and as the work is progressively completed, investigations will be extended to deposits at St. Leonards, Myalla, Campbell Town, Rosevale, Cressy, Swansea and other localities where discoveries have been made. Power, coal, limestone and other resources are to be examined to provide a complete assemblage of all factors relevant to the industry in order that a decision may be made upon the most suitable location for the plant.

Oil Shale.

Evidence was submitted to the Commonwealth Parliamentary Public Works Committee on the exploitation of the oil-shales of the Mersey Valley for the extraction by straight retorting of fuel oils with a by-product of bitumen, or alternatively the extraction of the oil-spores by flotation and conversion to bitumen by thermal controls with a by-product of fuel oils, but no development resulted. Other endeavours failed to induce effective interest in the setting up of an industry. Structural and physical conditions for underground mining and the overall low-grade nature of the shale continued to restrain commercial development.

QUANTITY AND VALUE OF MINERALS.

STATISTICS RELATING TO THE MINING INDUSTRY FOR THE YEAR ENDING 31ST DECEMBER, 1945.

Mineral.	Mineral Divisions.					Total Quantity.	Value.
	Northern and Southern.	Eastern.	North-Eastern.	North-Western.	Western.		
							£
Asbestos (tons)	....	....	....	....	276·36	276·36	7,193
Bismuth (tons)	....	·008	....	·521	....	·529	373
Copper (tons)	....	....	....	....	7,472·51	7,472·51	463,294
Coal (tons)	10,755	135,363	....	2,959	....	149,077	125,719
Cadmium (tons)	....	....	....	....	29·38	29·38	13,161
Cobalt Oxide (tons)	....	....	....	....	·25	·25	136
Carbide, Cement, and Limestone (tons)	9,537	....	....	92,744	5,171	107,452	273,588
Gold (fine oz.)	14·074	423·863	265·121	....	12,346·746	13,049·804	111,452
Kaolin (tons)	297	....	2,739·5	2,681·5	..	5,718	11,562
Lead (tons)	....	....	....	....	6,298·44	6,298·44	157,459
Ochre, Yellow (tons)	....	....	....	4·5	....	4·5	30
Ochre, Red (tons)	....	....	....	61·5	..	61·5	161
Osmiridium (oz.)	103·633	....	....	5·117	..	108·750	2,665
Pyrites (tons)	....	....	....	....	40,168	40,168	50,208
Scheelite (tons)		....	....	527·54	..	527·54	158,093
Silica (tons)	3,739	...	....	1	4,199	7,939	6,025
Silver (fine oz.)	....	...	....	.	816,157·38	816,157·38	102,101
Talc (tons)	....	..	..	152·75	....	152·75	532
Tin (tons)	3·988	317·090	339·697	63·3	77·164	801·239	240,369
Wolfram (tons)	....	208·981	....	2·129	....	211·110	69,896
Zinc (tons)	....	..	....	....	15,609·34	15,609·34	407,307
Total Value	....	...	....	....		....	£2,201,324
Total Value Australian Currency			....	..		....	£A2,622,806
Average Number of Men Employed	1,943	490	306	440	1,999	5,178	

The Electrolytic Zinc Company of Australasia Limited recovered 65,263 tons of zinc, valued at £1,501,049; 190·8694 tons of cadmium, valued at £85,510; and 13·6777 tons of cobalt oxide, valued at £6291, from other than Tasmanian ores; and employed an average of 1555 men at Risdon.

The Australian Commonwealth Carbide Co. Ltd., Electrona, produced 64·5 tons of calcium silicide, valued at £7224; and 1,314 tons of ferro-silicon, valued at £50,580.

W. H. WILLIAMS, Director of Mines.

ASBESTOS.

RETURN showing the Quantity and Value of Asbestos produced from 1899 to 1945 inclusive.

Year.	Quantity.	Value.
	Tons.	£
1899	200	363
1900	128	113
1901	46·5	45
1902-1915	—	—
1916	15	30
1917	271	271
1918	2854	5008
1919	51	1275
1920-1936	—	—
1937	2	29
1938	4·25	68
1939	—	—
1940	—	—
1941	3·5	120
1942	7	20
1943	18·25	365
1944	162·99	2242
1945	276·36	7193
Total	3979·85	£17,142

BISMUTH.

RETURN showing the Quantity and Value of Bismuth produced from 1904 to 1945 inclusive.

Year.	Quantity.	Value.
	Tons.	£
1904	·3	15
1905	3·5	800
1906	·3	24
1907	·175	27
1908	3·75	462
1909	2·9	980
1910	10·70	4249
1911	14·395	5758
1912	7·59	2646
1913	5·08	1627
1914	5·619	1666
1915	5·5	1203
1916	3·51	1059
1917	4·212	895
1918	4·608	1038
1919	1·77	573
1920	·10	9
1921	·05	21
1922	—	—
1923	—	—
1924	—	—
1925	—	—
1926	—	—
1927	—	—
1928	—	—
1929	—	—
1930	·97	475
1931	1·75	1015
1932	1·02	541
1933	1·32	705
1934	—	—
1935	·328	146
1936	—	—
1937	·216	78
1938	·871	396
1939	·623	296
1940	·565	270
1941	·032	16
1942	.02	10
1943	.309	241
1944	·151	126
1945	·529	373
Total	82·763	£27,740

BARYTES.

RETURN showing the Quantity and Value of Barytes produced to 31st December, 1945.

Year.	Quantity.	Value.
	Tons.	£
Prior to 1916	50	100
1916	83	359
1917	52	234
1918	217	977
1919	558	1886
1920	1029	4116
1921–1924	—	—
1925	3·5	16
1926–1928	—	—
1929	9·5	24
1930-1932	—	—
1933	5	15
1934–1935	—	—
1936	33	66
1937	76	174
1938	—	—
1939	—	—
1940	36	58
1941	11·2	43
1942-45	—	—
Total	2163·2	£8068

COAL.

RETURN showing the Quantity and Value of Coal raised to 31st December, 1945.

Year.	Quantity.	Value.
	Tons.	£
Previous to 1880	145,114	115,000
1880 to 1903 inclusive	767,261·5	659,010
1904	61,109	51,942
1905	51,993	44,194
1906	52,895·75	44,962
1907	58,891	50,057
1908	61,067·75	51,907
1909	66,161·75	56,237
1910	82,445	48,609
1911	57,067	26,214
1912	53,560	24,568
1913	55,043	25,367
1914	60,794	27,853
1915	64,536·25	30,418
1916	55,575	27,736
1917	63,412	38,673
1918	60,163	37,676
1919	66,253	47,004
1920	75,429	64,005
1921	66,476	63,446
1922	69,238	61,016
1923	80,718	70,797
1924	75,988	66,555
1925	81,698	70,424
1926	102,358	90,401
1927	112,056	99,802
1928	128,500	106,558
1929	130,291	105,877
1930	138,716	110,253
1931	123,828	98,004
1932	111,853	86,733
1933	116,573	85,848
1934	113,633	81,262
1935	123,714	86,134
1936	132,264	92,269
1937	91,121	66,883
1938	83,753	61,991
1939	99,392	74,460
1940	83,136	63,688
1941	109,714	85,311
1942	134,442	108,241
1943	145,882	117,361
1944	143,641	122,673
1945	149,077	125,719
Total	4,706,833	£3,673,138

COPPER.

The production for the year was 7472·51 tons, valued at £463,294.

RETURN showing the Quantity and Value of Copper in Blister Copper, Copper Ore, and Zinc Lead Ore during the Years 1919 to 1945 inclusive.

Year.	In Zinc Lead Ore.		In Blister Copper.		In Copper Ore.		Total	
	Q'ty.	Value.	Q'ty.	Value.	Q'ty.	Value.	Q'ty.	Value.
	Tons.	£	Tons.	£	Tons.	£	Tons.	£
1919	...	...	5014	503,977	304	4651	5318	508,628
1920	...	...	4791	528,177	·75	60	4791·75	528,237
1921	...	...	6171	462,876	9·843	287	6180·843	463,163
1922	...	...	5616	391,535	—	—	5616	391,535
1923	...	...	6063	435,282	1·7	131	6064·7	435,413
1924	...	...	6698	457,386	—	—	6698	457,386
1925	...	...	6539	436,661	—	—	6539	436,661
1926	...	...	6915	454,854	—	—	6915	454,854
1927	...	...	5811	362,988	—	—	5811	362,988
1928	...	...	6421	444,802	—	—	6421	444,802
1929	...	...	8690·01	740,985	—	—	8690·01	740,985
1930	...	...	9940·68	620,578	—	—	9940·68	620,578
1931	...	...	9833·1	416,309	—	—	9833·1	416,309
1932	...	...	10,995	399,646	3·2	116	10,998·2	399,762
1933	...	...	10,734	395,109	5	177	10,739	395,286
1934	...	...	8,202	267,126	6·5	216	8208·5	267,342
1935	...	...	13,036	464,007	—	—	13,036	464,007
1936	...	...	13,040	556,734	—	—	13,040	556,734
1937	...	...	12,382	757,311	37·92	2021	12,419·92	759,332
1938	...	...	12,700·62	578,893	28·802	1345	12,729·422	580,238
1939	...	...	13,453	668,561	—	—	13,453	668,561
1940	...	...	11,570·2	717,356	1·8	108	11,572	717,464
1941	...	...	11,642·1	721,810	2·834	175	11,644·934	721,985
1942	529·580	32,827	11,255·132	697,818	·478	30	11,785·09	730,675
1943	464·38	28,791	10,684	662,408	—	—	11,148·38	691,199
1944	381·75	23,666	9831	609,522	—	—	10,212·75	633,188
1945	275·51	17,080	7197	446,214	—	—	7472·51	463,294
Total	1,651·220	102,364	245,224·742	14,198,925	402·827	9317	247,278·789	14,310,606

The Mount Lyell Mining and Railway Company Limited. Return for the Calendar Year 1945.

Ore and metal-bearing material smelted:—

Source of Material.	Tons (Dry).
Ore:—From the Company's North Lyell Mine	2,332
Concentrates:—From the Company's North Lyell Mine, Lyell Comstock Mine, Crown Lyell Mine, and West Lyell Mines ore	30,064
Purchased ore	....
Total	32,396

Source of Material.	Tons (Dry).
Limestone delivered at works (tons)	5,171
Silica delivered at works	4,199
Pyritic concentrate shipped from Regatta Point (tons), approximate value £A50,210	40,168
Blister copper produced, 7,246 tons, containing:	
Copper (tons) 7,197 / Silver (oz.) 24,232 / Gold (oz.) 4,853 — Approximate value £A771,102.	
Average number of men employed—	
Mining Department—At the Company's North Lyell Mine	8
Ditto, Lyell Comstock Mine	3
Ditto, Crown Lyell Mine	....
Ditto, Royal Tharsis Mine	109
Ditto, West Lyell Mines	420
Miscellaneous	196
	738
Reduction Works Department (including Lake Margaret)	637
Railway Department—Mount Lyell Railway	98
Total	1,473

Copper produced from the inception of the Company to the 31st December, 1945, 403,817 tons.
Silver produced from the inception of the Company to the 31st December, 1945, 15,390,979 oz. (fine).
Gold produced from the inception of the Company to the 31st December, 1945, 493,293 oz. (fine).
Dividends paid during the year, Nil.
Dividends paid from the inception of the Company to the 31st December, 1945, £6,665,944.

CADMIUM.

The quantity recovered was 29·38 tons, valued at £13,161, compared with 39·68 tons valued at £17,840 for 1944.

RETURN showing the Quantity and Value of Cadmium recovered for the Years 1936 to 1945.

Year.	Quantity.	Value.
	Tons.	£
1924-1936	114·3057	31,713
1937	45	18,161
1938	49	18,636
1939	48	16,249
1940	50	18,242
1941	47·07	21,087
1942	41·39	18,462
1943	40·34	18,072
1944	39·68	17,840
1945	29·38	13,161
Total	504·1657	£191,623

CEMENT, CARBIDE, AND LIMESTONE.

The combined value of output from these three industries amounted to £273,588, as compared with £404,219 for 1944.

GOLD.

The quantity won was 13,049·804 oz., fine, valued at £111,452, as compared with 16,653·38 oz., valued at £139,886 for 1944.

RETURN showing the Quantity and Value of Gold won to 31st December, 1945.

Year.	Quantity.	Value.
	Oz.	£
Previous to 1867 and up to 1879 inclusive	131,583	512,557
1880 to 1903 inclusive	1,265,836·95	4,905,706
1904	65,921	280,015
1905	73,540·5	312,380
1906	60,023·4	254,963
1907	65,354·25	277,607
1908	57,085·1	242,482
1909	44,777·366	190,201
1910	37,048·053	157,370
1911	31,100·873	132,108
1912	37,973·252	161,300
1913	33,400·457	141,876
1914	26,243·453	111,475
1915	18,547·338	78,784
1916	15,790·096	67,072
1917	14,496·464	61,577
1918	10,528·930	44,724
1919	7,686·470	32,650
1920	6,246·192	29,796
1921	5,340·094	28,395
1922	3,431·486	15,998
1923	3,684·124	16,639
1924	4,625·600	21,563
1925	3,523·870	15,037
1926	4,222·748	17,936
1927	4860·7	20,649
1928	3603·43	15,306
1929	5596·88	23,772
1930	4467·2	18,975
1931	4759·31	22,118
1932	5937·17	34,943
1933	6672·74	41,783
1934	5612·26	38,930
1935	8342·68	59,255
1936	17,600·47	123,386
1937	20,276·31	143,138
1938	22,199·961	158,022
1939	19,984·066	154,471
1940	19,170·968	161,035
1941	19,908·498	167,229
1942	18,353·364	154,168
1943	17,245·253	144,860
1944	16,653·38	139,886
1945	13,049·804	111,452
Total	2,262,305·505	9,843,589

GRANITE (RED).

RETURN showing the Quantity and Value of Red Granite produced during the Years 1935 to 1945 inclusive

Year.	Quantity.	Value.
	Tons.	£
1935	284	1432
1936	568	3209
1937	187	923
1938	173	885
1939	246	1300
1940	330	2031
1941	658·5	5661
1942	355	2937
1943–45	...	...
Total	2801·5	18,378

IRON PYRITES.

RETURN showing the Quantity and Value of Iron Pyrites produced during the Years 1915 to 1945 inclusive.

Year.	Quantity.	Value.
	Tons.	£
1915	12,835·59	8945
1916	14,005·084	13,597
1917	7,685·549	7137
1918	5,105·600	4667
1919	3,456·95	4288
1920	4,440	7346
1921	606·5	2579
1922	8,276	18,620
1923	11,882	26,737
1924	—	—
1925	—	—
1926	—	—
1927	—	—
1928	—	—
1929	—	—
1930	—	—
1931	506·7	253
1932	274	150
1933	1498	1498
1934	12,030	12,030
1935	25,555	25,555
1936	34,071	34,071
1937	40,630	43,723
1938	50,277	62,845
1939	54,229	67,786
1940	37,819	47,274
1941	40,076	50,093
1942	34,449	43,061
1943	33,203	41,504
1944	29,136	36,419
1945	40,168	50,208
Total	502,214·973	£610,386

KAOLIN.

RETURN showing the Quantity and Value of Kaolin produced during the Years 1940 to 1945 inclusive.

Year.	Quantity.	Value.
	Tons.	£
1940	835·5	988
1941	1130	1428
1942	1098	1334
1943	1655	2438
1944	4193·25	4778
1945	5718	11,562
Total	14,629·75	22,528

LIMESTONE.

RETURN showing the Quantity and Value of Limestone produced during the Years 1919 to 1936 inclusive.

Year.	Quantity.	Value.
	Tons.	£
1919–1922 inclusive	200,454	199,470
1923	100,113	122,428
1924	146,140	146,140
1925	124,670	124,670
1926	153,707	153,219
1927	169,522	167,373
1928	98,654	79,050
1929	68,176	66,597
1930	100,251	94,977
1931	55,268	49,490
1932	90,335	18,725
1933	110,347	33,048
1934	174,767	44,877
1935	254,438	68,367
1936	262,101	71,243
Total	2,108,943	£1,439,674

LEAD.

The output was 6298·44 tons, valued at £157,459, as compared with 8226·5 tons, valued at £205.661 for 1944.

RETURN showing the Quantity and Value of Lead included in Silver Lead during the Years 1919 *to* 1945 *inclusive.*

Year.	Quantity.	Value.
	Tons.	£
1919–1923	17,359·515	484,711
1924	4559·110	154,881
1925	5525·99	197,452
1926	5892·58	183,167
1927	5583·12	135,403
1928	4786·78	101,616
1929	5983·07	138,793
1930	4237·84	77,590
1931	2189·47	29,024
1932	2694·06	32,637
1933	2644·12	30,987
1934	1507	16,723
1935	1488	21,390
1936	7563·04	134,413
1937	9116·62	212,492
1938	10,652·21	163,102
1939	11,020·96	173,670
1940	13,550·85	338,771
1941	11,753·47	293,837
1942	9360·42	234,011
1943	8632·72	215,817
1944	8226·5	205,661
1945	6298·44	157,459
Total	160,625·885	£3,733,607

NICKEL.

RETURN showing the Quantity and Value of Nickel produced from 1927 *to* 1945 *inclusive.*

Year.	Quantity.	Value
	Tons.	£
1927–1931	193·6	33,162
1932	0·55	136
1933	8·65	1948
1934–37	—	—
1938	19·75	3604
1939–45	—	—
Total	222·55	£38,850

OCHRE.

RETURN showing the Quantity and Value of Ochre produced during the Years 1918 *to* 1945 *inclusive.*

Year.	Quantity.	Value.
	Tons.	£
1918–1923	114	256
1924	20	50
1925	—	—
1926	38	69
1927–1939	—	—
1940	3·5	9
1941	—	—
1942	21	53
1943	380	1681
1944	74·5	233
1945	66	191
Total	717	£2542

OSMIRIDIUM.

The quantity of metal won during the year was 108·75 oz., valued at £2665, as compared with 107·02 oz., valued at £2619 for 1944.

RETURN showing the Quantity and Value of Osmiridium produced during the Years 1910 *to* 1945 *inclusive.*

Year.	Quantity.	Value.
	Oz.	£
1910	120	530
1911	271·88	1888
1912	778·77	5742
1913	1261·65	12,016
1914	1018·83	10,076
1915	247·048	1581
1916	222·150	1899
1917	332·079	4898
1918	1606·743	44,833
1919	1668·715	39,614
1920	2009·196	77,104
1921	1750·655	42,935
1922	1173·924	35,512
1923	673·423	19,642
1924	364·805	10,617
1925	3365·543	103,570
1926	3202·5	61,908
1927	632·777	7456
1928	1627·186	42,458
1929	1324	30,624
1930	952·7	16,235
1931	1279·54	18,028
1932	784·95	9075
1933	548	4843
1934	487·7	4622
1935	234·82	2103
1936	280·6	3862
1937	586·42	9077
1938	190·87	2976
1939	283·065	5014
1940	464·740	11,604
1941	206·578	4212
1942	142·094	2930
1943	89·695	2087
1944	107·02	2619
1945	108·75	2665
Total	30,399·416	£656,855

SHALE.

RETURN showing the Quantity and Value of Shale produced during the Years 1910 to 1945 inclusive.

Year.	Quantity.	Value.
	Tons.	£
1910	364	214
1911	500	250
1912	—	—
1913	130	130
1914	75	75
1915	—	—
1916	1286	1286
1917	—	—
1918	—	—
1919	600	900
1920	140	172
1921	868	1506
1922	40	100
1923	1101	1094
1924	1576	1526
1925	820	559
1926	2127	1475
1927	3150	2050
1928	9052	7754
1929	4299	2982
1930	5428	4356
1931	1402	600
1932	1907	1074
1933	3101	1483
1934	3276	1630
1935	30	15
1936–1945	—	—
Total	41,572	£31,231

RETURN showing the Quantity of Oil Distilled from Shale.

Year.	Name of Company.	Gallons.
1910	Tasmanian Shale and Oil Company	4800
1915	Railton-Latrobe Shale Oil Co. N.L.	24,000
1927–1928	Australian Shale Oil Corporation	65,000
1929	Goliath Portland Cement Company	2200
1930	Goliath Portland Cement Company	20,101
	Tasmanite Shale Oil Company Ltd.	35,000
1931	Tasmanite Shale Oil Company Ltd.	31,915
1932	Tasmanite Shale Oil Company Ltd.	79,236
1933	Tasmanite Shale Oil Company Ltd.	56,958
1934	Tasmanite Shale Oil Company Ltd.	37,905
1935–45	Tasmanite Shale Oil Company Ltd.	—
	Total	357,115

SCHEELITE.

RETURN showing the Quantity and Value of Scheelite produced during the Years 1917 to 1945 inclusive.

Year.	Quantity.	Value.
	Tons.	£
1917–1920	589·07	112,468
1921–1937	—	—
1938	30·53	6193
1939	170·695	33,301
1940	275·48	49,120
1941	246·913	42,700
1942	215·332	71,353
1943	199·201	68,908
1944	32·21	10,842
1945	527·54	158,093
Total	2286·971	£5 52,978

SILVER.

The output was 816,157·38 oz. (fine), valued at £102,101, as compared with 1,028,176·29 oz., valued at £107,957 for 1944.

RETURN showing the Quantity and Value of Silver contained in Silver-Lead, Blister Copper, Copper Ore, Zinc Lead Ore, and Gold Ore during the Years 1919 to 1945 inclusive.

Year.	In Silver-Lead.		In Blister Copper		In Copper Ore.		In Gold Ore.		In Zinc Lead Ore.		Total.	
	Quantity.	Value	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Oz.	£	Oz.	£	Oz.	£	Oz.	£	Ozs.	£	Oz.	£
1919	296,719·27	71,831	228,624	53,733	...	...	...	...	...	...	525,343·27	125,564
1920	453,411	118,898	169,948	47,869	...	...	...	...	...	...	623,359	166,767
1921	165,637	27,181	183,021	30,395	...	...	...	...	...	...	348,658	57,576
1922	674,886	104,926	119,699	18,511	...	...	...	...	...	...	794,585	123,437
1923	516,073·61	73,742	122,528	17,597	...	...	...	...	...	...	638,601·61	91,339
1924	494,782	75,398	147,376	22,439	...	...	...	...	...	...	642,158	97,837
1925	597,012·67	86,283	133,181	19,226	...	...	...	...	...	...	730,193·67	105,509
1926	632,066	80,597	134,587	17,394	...	...	...	...	...	...	766,653	97,991
1927	640,575	75,135	101,207	11,889	...	...	...	...	...	...	741,782	87,024
1928	564,056	66,386	105,270	12,515	...	...	...	...	...	...	669,326	78,901
1929	714,939	78,252	149,424	16,308	...	...	...	...	...	...	864,363	94,560
1930	518,641	41,485	182,978	14,583	...	...	...	...	...	...	701,619	56,068
1931	242,950	16,104	148,782	9650	...	...	...	...	...	...	391,732	25,754
1932	301,854	24,399	161,634	12,905	...	...	...	...	...	...	463,488	37,304
1933	361,768	29,394	127,562	10,414	...	...	...	...	...	...	489,330	39,808
1934	194,747	18,401	89,940	8726	...	...	...	...	...	...	284,687	27,127
1935	191,044	24,780	132,857	17,543	...	...	...	...	...	...	323,901	42,323
1936	803,269	71,886	103,189	9150	...	...	...	...	...	...	906,458	81,036
1937	977,552	88,252	83,233	7518	...	...	...	...	...	...	1,060,785	95,770
1938	1,152,568	98,913	66,982	5758	...	...	...	...	...	...	1,219,550	104,671
1939	1,207,604	111,893	70,512	6417	...	...	...	...	...	...	1,278,116	118,310
1940	1,549,859	155,596	58,659	5854	119	13	44	4	...	...	1,608,681	161,447
1941	1,282,795	134,693	43,830	4601	113	12	...	..	...	...	1,326,738	139,306
1942	207,050	21,739	36,207	3802	...	...	...	...	946,804·44	99,414	1,190,061·44	124,955
1943	193,070	20,273	44,321	4653	...	...	...	...	879,184·67	92,315	1,116,575·67	117,241
1944	143,640	15,082	38,047	3994	...	...	...	...	846,489·29	88,881	1,028,176·29	107,957
1945	136,390	17,188	24,232	2917	...	...	...	...	655,535·38	81,996	816,157·38	102,101
Total	15,214,958·55	1,748,687	3,007,830	396,361	232	25	44	4	3,338,013·78	362,606	21,551,078·33	2,507,683

TALC.

RETURN showing Quantity and Value of Talc produced during the Years 1928 *to* 1945 *inclusive.*

Year.	Quantity.	Value.
	Tons.	£
1928	32	96
1929	23	45
1930	13·35	53
1931	15	58
1932	5	17
1933	8·75	22
1934	5·5	16
1935	—	—
1936	3	8
1937-1943	—	—
1944	4	16
1945	152·75	532
Total	262·35	863

TIN.

The output was 801·239 tons, valued at £240,369, as compared with 809·671 tons, valued at £235,612 for 1944.

RETURN showing the Quantity and Value of Metallic Tin exported from Tasmania from 1873 *to* 1904 *(compiled from Customs Returns only), and Meta. Tin produced during the Years* 1905 *to* 1945 *inclusive.*

Year.	Quantity.	Value.
	Tons.	£
1873–1879 inclusive	16,429	1,054,923
1880 to 1904 inclusive	53,695·88	7,167,564
1905	2724·05	362,670
1906	3130·925	557,266
1907	3039·925	501,681
1908	3164·56	421,580
1909	3157·84	418,165
1910	2590·707	399,393
1911	2767·135	513,500
1912	2599·775	543,103
1913	2807·287	531,983
1914	1800·899	259,300
1915	1819·463	292,306
1916	1998·245	350,852
1917	1846·135	427,917
1918	1579·342	488,798
1919	1580·22	395,794
1920	1310·411	369,362
1921	790·395	130,257
1922	679·440	112,407
1923	1160·390	236,955
1924	1108·450	275,014
1925	1129·662	297,515
1926	1096·16	322,526
1927	1105·74	317,593
1928	1140·14	258,676
1929	640·36	130,014
1930	511·77	69,592
1931	588·83	70,634
1932	793·92	109,767
1933	957	190,041
1934	952·49	219,246
1935	1131	258,919
1936	1004·06	206,656
1937	1089·839	260,673
1938	1278·617	244,037
1939	1249·877	282,798
1940	1430·198	367,127
1941	1255·729	328,340
1942	1148·048	297,919
1943	948·817	246,218
1944	809·671	235,612
1945	801·239	240,369
Total	132,843·691	£20,767,227

WOLFRAM.

RETURN showing the Quantity and Value of Wolfram produced during the Years 1899 *to* 1945 *inclusive.*

Year.	Quantity.	Value.
	Tons.	£
1899 to 1903 inclusive	57·34	2157
1904	15·5	1147
1905	32·25	2371
1906	19·75	1465
1907	40·75	4411
1908	4·5	338
1909	28·35	2494
1910	67·35	7280
1911	69·96	7769
1912	66·49	6601
1913	68·07	7040
1914	46·873	4327
1915	94·685	11,115
1916	106·265	16,910
1917	172·190	28,714
1918	155·362	27,239
1919	120·907	26,613
1920	70·89	13,626
1921	10·34	676
1922	19·26	1024
1923	96·86	6150
1924	54	2785
1925	174·170	14,658
1926	83·15	5265
1927	148·57	9896
1928	176·15	12,094
1929	151·86	18,358
1930	112·6	12,216
1931	0·29	16
1932	—	—
1933	104·05	7,301
1934	194·19	27,375
1935	232·13	29,345
1936	207·13	28,323
1937	291·04	71,643
1938	299·104	63,348
1939	227·604	44,356
1940	234·304	42,319
1941	235·502	42,536
1942	183·23	58,397
1943	230·025	82,965
1944	241·875	86,749
1945	211·11	69,896
Total	5156·456	£909,298

ZINC.

RETURN showing the Quantity and Value of Zinc produced during the Years 1919 *to* 1945 *inclusive.*

Year.	Quantity.	Value.
	Tons. *	£
1919	285	13,110
1920	9·3	334
1921–1923	—	—
1924	2748·75	90,485
1925	3112·69	110,691
1926	5377·75	183,362
1927	6326·2	181,242
1928	7112	188,691
1929	6977	185,964
1930	943	19,322
1931–1935	—	—
1936	18,769	283,105
1937	23,481	525,824
1938	25,366	356,452
1939	25,021	366,176
1940	26,262	715,632
1941	24,468·6	666,768
1942	21,472·15	585,116
1943	21,078·81	574,398
1944	20,833·15	567,702
1945	15,609	407,307
Total	255,252·4	£6,021,679

* 1917, 1918 have been deleted. Product of Broken Hill.

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED.

RETURN FOR THE YEAR 1945.

EXTRACTION FROM ORES AND CONCENTRATES: RISDON.

From other than Tasmanian Ores—

Zinc	65,263 tons
Cadmium	190·8694 tons
Cobalt oxide	13·6777 tons

From Tasmanian Ores—

Zinc	18,510 tons
Cadmium	38·2 tons
Cobalt oxide	·25 tons
Lead	765 tons
Silver	113,530 oz.

Men Employed—

The average number of men employed was 1555.

WEST COAST DIVISION.

Ore Mined—

	Tons.
From Hercules Mine	39,174
From Rosebery Mine	69,632
Total	108,806

Concentrates Produced—

	Tons.
Zinc concentrates	32,657
Lead concentrates	6,902
Copper concentrates	3,097
	42,656

Recoverable Quantity in Ores Mined—

Zinc	15,609·34 tons
Lead	5,137·44 tons
Copper	275·51 tons
Cadmium	29·38 tons
Silver	655,535·38 oz.
Gold	7,478·67 oz.

Average Number of Men Employed—

Hercules Mine	58
Rosebery Mine	300
Zeehan Smelters	28
Total	386

QUANTITY AND VALUE OF METALS AND MINERALS RAISED.

RETURN showing Quantity and Value of Metals and Minerals Raised in Tasmania as at 31st December, 1945.

Mineral or Metal.	Quantity.	Value.
		£
Asbestos (tons)	3,979·85	17,142
Barytes (tons)	2,163·2	8,068
Bismuth (tons)	82·763	27,740
Cadmium (tons)	504·1657	191,623
Carbide, Cement, and Limestone (tons)	2,602,982·1	3,765,196
Carbide to 1936 (now under Carbide, Cement, and Limestone) (tons)	62,090	1,212,207
Cement to 1936 (now under Carbide, Cement, and Limestone) (tons)	525,391	2,004,014
Coal (tons)	4,706,833	3,673,138
Cobalt Oxide (tons)	5·13	2,355
Copper (Blister) to 1918 (now shown under Silver and Copper) (tons)	166,600	13,788,527
Copper Matte (tons)	6,227	133,736
Copper Ore to 1918 (now under Copper) (tons)	41,768·63	577,873
Copper (from 1919) (tons)	247,278·789	14,310,606
Dolomite (tons)	10	25
Gold (fine oz.)	2,262,305·505	9,843,589
Granite (Red) (tons)	2,801·5	18,378
Graphite (tons)	17	26
Ilmenite (tons)	550	1,256
Iron Ore (tons)	46,177	31,770
Iron Pyrites (tons)	502,214·973	610,386
Kaolin (tons)	14,629·75	22,528
Lead (from 1919) (tons)	160,625·885	3,733,607
Limestone to 1936 (now under Carbide, Cement, and Limestone) (tons)	2,108,943	1,439,674
Manganese (tons)	·6	3
Monazite (tons)	32·6	488
Nickel (tons)	222·55	38,850
Ochre (tons)	717	2,542
Osmiridium (oz.)	30,399·416	656,855
Rutile (tons)	·5	18
Scheelite (tons)	2,286·971	552,978
Silica (tons)	69,990	32,800
Shale (tons)	41,572	31,231
Silver Lead to 1918 (now shown under Silver and Lead) (tons)	1,083,897·821	6,429,291
Silver (from 1919) (fine oz.)	21,551,078·33	2,507,683
Talc (tons)	262·35	863
Tin (tons)	132,843·691	20,767,227
Wolfram (tons)	5,156·456	909,298
Zinc (tons)	255,252·4	6,021,679
Total	....	£93,365,270

STATISTICS OF PRODUCTION.

RETURN showing the Annual Published Value of Mineral Products for the State of Tasmania from 1880 to 1945 inclusive.

Year.	Value.	Year.	Value.
	£		£
1880	554,031	1915	1,225,575
1881	602,723	1916	1,521,050
1882	556,306	1917	1,580,354
1883	560,873	1918	1,444,814
1884	468,302	1919	1,301,090
1885	518,885	1920	1,421,104
1886	489,966	1921	822,851
1887	593,256	1922	1,013,415
1888	616,733	1923	1,219,456
1889	504,718	1924	1,496,804
1890	444,210	1925	1,700,861
1891	528,388	1926	1,808,847
1892	526,909	1927	1,621,027
1893	627,909	1928	1,593,828
1894	732,764	1929	1,790,653
1895	575,692	1930	1,270,114
1896	662,058	1931	894,986
1897	1,006,140	1932	897,168
1898	1,071,084	1933	1,053,373
1899	1,660,622	1934	1,037,351
1900	1,888,695	1935	1,387,511
1901	1,763,896	1936	1,979,637
1902	1,378,406	1937	2,653,822
1903	1,354,044	1938	2,294,735
1904	1,379,204	1939	2,520,282
1905	1,729,129	1940	3,137,330
1906	2,257,147	1941	3,055,838
1907	2,277,159	1942	2,832,189
1908	1,650,027	1943	2,686,664
1909	1,574,995	1944	2,581,366
1910	1,432,193	1945	2,201,324
1911	1,349,497	Value of production 1867-1945, previously unrecorded	2,067,650
1912	1,493,502		
1913	1,415,700		
1914	1,007,038	Total	£93,365,270

STATISTICS OF MINING COMPANIES.

RETURN showing the Amounts Paid in Dividends by Mining Companies during the Year ending 31st December, 1945.

Mines.	Dividends.
	£ s. d.
Copper	77,500 0 0
Gold	...
Tin	35,900 0 0
Silver	...
Coal	2350 0 0
Scheelite	...
Zinc	* 270,000 0 0
Total	£385,750 0 0

* This amount represents total dividends out of Tasmanian and ex-Tasmanian profits.

RETURN showing the Mining Companies Registered during the Year ending 31st December, 1945.

Number of Companies.	Capital.
1	£9000 0 0

In addition to the above, 1 agent for foreign companies under the Mining Companies (Foreign) Act, 1884, was registered. One syndicate under Part V. of the Mining Companies Act, 1884, was registered.

RETURN showing the Total Number of Leases and Licences in Force on 31st December, 1945.

Mineral.	Number.	Number of Sluiceheads.	Area
			Acres.
Asbestos	3	...	120
Barytes	1	...	10
Bismuth	...	...	...
Coal	31	...	5563
Clay	4	...	196
Copper	1	...	33
Copper-Nickel	...	...	...
Dolomite	...	...	...
Granite	4	...	30
Gold	55	...	955
Iron	5	...	298
Limestone	5	...	297
Lead-Zinc	1	...	80
Molybdenum	...	...	...
Minerals	38	...	5402
Marble	...	...	...
Manganese	...	...	10
Osmiridium	1	...	10
Ochre	2	...	24
Pyrites	1	...	80
Quartzite	1	...	8
Scheelite	3	...	281
Shale	3	...	117
Silica	1	...	10
Silver	10	...	337
Stone	4	...	67
Sand	1	...	5
Serpentine, &c.	3	...	240
Tin	253	...	6930
Wolfram	5	...	59
Mining Easements and Machinery Sites	81	...	760
Licences to Search	...	...	...
Water Licences	264	1230	2005
Total	781	1230	23,917

RETURN showing the Total Amount of Rents, Fees, &c., received by the Mines Department during the Year ending 31st December, 1945.

Head of Revenue.	Amount.
	£ s. d.
Rent of Auriferous and Mineral Lands	6425 1 8
Fees, Auriferous and Mineral Lands	310 10 2
Survey Fees	381 14 0
Fees under the Explosives and Inflammable Liquids Act	2373 6 8
Total	£9,490 12 6

RETURN showing the Total Area of Land and Number of Sluiceheads of Water Applied for during the Year ending 31st December, 1945.

Mineral.	Number.	Sluiceheads.	Area.
			Acres.
Asbestos	...	...	...
Bismuth	...	...	...
Barytes	...	...	...
Clay	2	...	45
Coal	...	...	...
Dolomite	...	...	...
Gold	...	...	...
Granite	...	...	...
Iron	...	...	...
Lead	...	...	...
Limestone	3	...	203
Manganese	...	...	...
Minerals	...	...	...
Silver-Lead	1	...	40
Ochre	...	...	...
Phosphate	...	...	...
Serpentine	...	...	...
Talc	...	...	...
Tin	20	...	1031
Wolfram	...	...	...
Machinery Sites and Mining Easements	6	...	211
Water-rights and Dam Sites	...	23	22
Licences to search for Coal	...	...	...
Total	32	23	1552

RETURN showing Total Number and Area of Leases and Licences Issued during the Year ending 31st December, 1945.

Mineral.	Leases.	Sluiceheads.	Area.
			Acres.
Asbestos	3	...	120
Barytes	...	...	...
Clay	2	...	120
Copper	...	...	...
Copper-Nickel	...	...	...
Coal	3	...	186
Granite	...	...	...
Gold	2	...	50
Iron Ore	...	...	...
Limestone	...	...	...
Minerals	4	...	873
Manganese	...	...	...
Nickel	...	...	...
Ochre	...	...	...
Quartzite	...	...	...
Silver	...	...	...
Silica	...	...	...
Silver-Lead	...	...	...
Stone	...	...	...
Tin	36	...	667
Wolfram	...	...	...
Water-rights and Dam Sites	48	353	643
Licences to Search for Coal and Oil	...	...	...
Mining Easements and Machinery Sites	12	...	259
Total	110	353	2918

Comparative Statement of Revenue from Mines, being Rents, Fees, Storage of Explosives, &c., (exclusive of Survey Fees), Paid to the Treasury for the Years ending 30th June, from 1883 to 1903, and for Six Months ending 31st December, 1903, and for the Years ending 31st December, 1904 to 1945 inclusive.

Year.	Amount.	Year.	Amount.
	£ s. d.		£ s. d.
1883	15,439 14 5	1914	14,087 0 6
1884	6981 11 10	1915	17,679 3 6
1885	11,070 5 7	1916	14,678 19 10
1886	12,523 10 4	1917	14,669 7 2
1887	14,611 11 5	1918	17,833 14 9
1888	23,502 8 4	1919	15,388 7 7
1889	17,254 9 0	1920	16,767 11 6
1890	26,955 4 9	1921	11,248 14 11
1891	37,829 16 5	1922	14,184 7 3
1892	17,568 18 4	1923	13,224 11 9
1893	16,971 9 2	1924	14,678 13 11
1894	16,732 7 7	1925	14,229 8 7
1895	15,323 1 9	1926	15,163 15 7
1896	20,901 13 2	1927	16,887 9 9
1897	25,631 0 3	1928	14,313 12 0
1898	33,661 13 9	1929	14,665 10 7
1899	24,696 10 5	1930	11,166 7 2
1900	28,380 11 10	1931	11,520 1 10
1901	21,569 5 2	1932	10,097 18 6
1902	19,471 0 1	1933	9459 6 9
1903	17,776 14 3	1934	11,166 2 11
1903, 1 July to 31 Dec.	14,758 17 1	1935	10,548 10 0
1904, Jan. to Dec.	16,631 8 2	1936	11,023 11 3
1905	20,208 17 0	1937	12,206 10 1
1906	24,136 12 5	1938	11,177 11 5
1907	24,794 7 7	1939	11,556 5 1
1908	20,311 3 0	1940	11,018 3 9
1909	22,804 1 5	1941	10,835 18 8
1910	22,221 18 0	1942	9,509 18 2
1911	20,556 15 10	1943	9,449 9 7
1912	17,639 19 11	1944	8,952 5 3
1913	19,410 17 8	1945	9,108 18 6

The above Statement does not include Stamp Duties upon Transfer of Leases and Tax payable upon Dividends, from which sources large sums are derived.

RETURN showing the Number and Area of Leases Held under the Mining Act in force on 31st *December,* 1931 *to* 1945 *inclusive.*

Nature of Lease.	In force on 31st Dec., 1931.		In force on 31st Dec., 1932.		In force on 31st Dec., 1933.		In force on 31st Dec., 1934.		In force on 31st Dec., 1935.		In force on 31st Dec., 1936.		In force on 31st Dec., 1937.		In force on 31st Dec., 1938.		In force on 31st Dec., 1939.		In force on 31st Dec., 1940.		In force on 31st Dec., 1941.		In force on 31st Dec., 1942.		In force on 31st Dec., 1943.		In force on 31st Dec., 1944.		In force on 31st Dec., 1945.	
	No.	Area.	No.	Area	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No	Area.	No.	Area.	No.	Area.
For Minerals, Silver, Tin, &c.	379	Acres. 17,101	284	Acres. 13,320	326	Acres. 16,734	444	Acres. 18,716	500	Acres. 19,802	585	Acres. 21,096	603	Acres. 21,368	595	Acres. 23,497	463	Acres. 18,843	474	Acres. 16,838	436	Acres. 15,892	377	Acres. 15,135	333	Acres. 15,075	423	Acres. 16,517·50	373	Acres. 14,665
For Coal, Stone, Shale, &c.	25	7223	32	6104	39	7495	51	8439	47	6635	48	7249	50	6778	43	4904	49	6683	53	6517	56	7151	53	6732	53	6683	60	7032	63	6687
For Gold	57	999	77	1987	128	3879	167	3987	162	3190	155	3183	22	2619	117	2491	108	1850·5	110	1759·5	106	2041	75	1176	59	914	113	1948	55	955
Dredging Claims	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mining Easements	77	434	48	316	79	475	94	578	107	629	112	634	112	663	97	630	86	617·25	85	616·25	83	529	83	511·25	78	570·75	82	633·75	81	760
Machinery Sites	20	209	18	120	17	119																								
Licences to search for Coal or Oil	1	800	1	320	2	790	2	3670	2	4200	5	10,900	6	10,600	2	1180	2	1180	—	—	—	—	—	—	1	900	2	1800	—	—
Water-rights, Mineral and Gold	388	2078 & 1546 sluice-heads	391	2448 & 1473 sluice-heads	400	1905 & 1650 sluice-heads	403	2015 & 1760 sluice-heads	447	2092 & 1835 sluice-heads	466	1963 & 2034 sluice-heads	467	2243 & 2049 sluice-heads	448	1834 & 2191 sluice-heads	388	2172·75 & 1574 sluice-heads	395	2183 & 1478 sluice-heads	386	2065 & 1428 sluice-heads	346	2031·75 & 1586 sluice-heads	293	2015·25 & 1319 sluice-heads	300	2062·25 & 1343 sluice-head	264	2005 & 1230 sluice-heads

TABLE showing the Average Annual Prices for Minerals During Recent Years.

	Average for **1932.**	Average for **1933.**	Average for **1934.**	Average for **1935.**	Average for **1936.**	Average for **1937.**	Average for **1938.**	Average for **1939.**	Average for **1940.**	Average for **1941.**	Average for **1942.**	Average for **1943.**	Average for **1944.**	Average for **1945.**
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Copper—Standard, spot: per ton	31 14 7	32 11 4	30 6 4	31 18 1	36 12 6	60 5 9 Electrolytic.	45 16 9 Electrolytic.	49 17 7 Electrolytic.	62 0 0 Electrolytic.	62 0 0 Electrolytic.	62 0 0 Electrolytic.	62 0 0 Electrolytic.	62 0 0 Electrolytic.	62 0 0 Electrolytic.
Lead—Soft Foreign: per ton	12 0 9	11 16 1	11 1 0	14 5 8	16 7 9	23 6 1	15 6 5	15 13 7	25 0 0	25 0 0	25 0 0	25 0 0	25 0 0	25 0 0
Spelter: per ton	13 13 10	15 14 11	13 15 6	14 0 0	14 6 11	22 6 8	14 1 7	14 14 0	25 15 0	25 15 0	25 15 0	27 5 0	27 5 0	27 12 6
Tin—Standard, spot: per ton	135 18 10	194 13 4	230 7 5	225 14 6	208 6 6	242 6 7	189 12 1	226 5 6	256 12 3	261 8 0	259 10 0	259 10 0	289 17 6	300 0 0
Silver—Standard, spot: per oz.	s. d. 1 5·842	s. d. 1 6·144	s. d. 1 9·208	s. d. 1 9·951	s. d. 1 9·647	s. d. 1 9·65	s. d. 1 9·066	s. d. 1 8·461	s. d. 2 1·048	s. d. 1 11·439	s. d. 1 11·439	s. d. 1 11·439	s. d. 1 11·439	s. d. 2 6
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s.	£ s. d.	£ s. d.
Osmiridium per oz.	11 11 0	8 16 9	9 11 2	9 0 0	12 10 0	15 12 6	15 0 4	17 15 0	24 0 0	20 7 2	20 12 4	23 10 11	24 10 6	24 10 6
Wolfram: per ton	62 16 0	81 2 6	94 0 0	175 0 0	161 5 0	325 19 0 WO_3	289 0 0 WO_3	271 0 0 WO_3	250 0 0 WO_3	250 0 0 WO_3	437 10 0 WO_3	500 0 0 WO_3	500 0 0 WO_3	462 10 0 WO_3
Gold: per f. oz.	5 18 0	6 4 10	6 17 8	7 2 6	7 0 4	7 1 3	7 2 6	7 15 2	8 8 0	8 8 0	8 8 0	8 8 0	8 8 0	8 10 10

AID TO MINING.

The policy of assistance to mining was continued under the provisions of the Aid to Mining Act. Several grants were made for the development of mines, purchase of plants, provision of supplies of water and for other purposes allied with mining. Sustenance allowance was granted to organised parties for prospecting in approved localities but no discoveries of economic moment resulted.

An amount of £187 was expended and afforded employment for 5 men, and amounts aggregating £4500 were advanced to operating mines for plant installations and developmental operations. Repayments made against advances totalled £4545.

Wartime conditions did not favour lead and gold mining and production was depressed but in the early post-war period endeavours were made to establish conditions that would restore interest in developmental operations. Material results accrued in regard to markets and metal prices and it is expected that a forward move will be made in the rehabilitation of silver-lead mining.

THE AID TO MINING ACT, 1927.

STATEMENT OF RECEIPTS AND PAYMENTS OF THE MINING TRUST FUND FOR YEAR ENDED 31ST DECEMBER, 1945.

RECEIPTS.	£ s. d.	PAYMENTS.	£ s. d.
Balance, 31st December, 1944	10,123 10 11	Sustenance allowance	....
Repayments of loans	681 15 9	Assistance	187 9 8
Hire drilling plant	75 0 0	Insurances	4 9 8
		Total payments	191 19 4
		Excess of receipts over payments	10,688 7 4
	£10,880 6 8		£10,880 6 8

THE AID TO MINING (FEDERAL GRANT) TRUST FUND.

(22 Geo. V. No. 92, and 26 Geo. V. No. 8, and 2 Geo. VI. No. 68.)

RECEIPTS AND PAYMENTS STATEMENT.

RECEIPTS. Item.	March, 1935 (commencement) to 31st Dec., 1945. £ s. d.	1st Jan., 1945 to 31st Dec., 1945. £ s. d.
Provided by—		
Commonwealth £25,750		
State 9,250		
	35,000 0 0	....
Transfer of balance from—		
The Aid to Mining (Federal Grant) Trust Fund, 1936-37 (1 Edw. VIII. No. 20)	1,883 18 2	....
The Aid to Mining (Federal Grant) Trust Fund, 1937-38 (1 Geo. VI. No. 32)	798 9 11	....
Other credits—		
Batteries	99 13 2	....
Advances	8,522 9 0	1,368 10 5
Plants and operation thereof	11 18 8	....
Metallurgical investigations	0 7 11	....
Staff	0 10 10	....
Balance brought forward period ended 31st December, 1945	....	3,425 14 5
	£46,317 7 8	£4,794 4 10

PAYMENTS. Item.	March, 1935 (commencement) to 31st Dec., 1945. £ s. d.	1st Jan., 1945 to 31st Dec., 1945. £ s. d.
Prospecting	1,584 6 6	....
Batteries	1,328 14 0	....
Advances	22,785 5 7	14 7 1
Plants and operation thereof	6,711 9 11	.
Metallurgical investigations	1,237 3 4	....
Roads and tracks	6,486 8 8	....
Transport	829 10 10	....
Staff	574 11 1	....
Total payments	41,537 9 11	....
Excess receipts over payments	4,779 17 9	4,779 17 9
	£46,317 7 8	£4,794 4 10

GOLD MINING ENCOURAGEMENT ACT, 1940.

(Commonwealth Act, No. 38 of 1940.)

RECEIPTS AND PAYMENTS STATEMENT OF THE GOLD MINING ENCOURAGEMENT (COMMONWEALTH) DEPOSIT ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1945.

RECEIPTS.	£	s.	d.	PAYMENTS.	£	s.	d.
Balance brought forward, 31st December, 1944	2,000	0	0	Advances	....		
Repayments	....			Excess receipts over payments	2,000	0	0
Interest	....						
	£2,000	0	0		£2,000	0	0

STATEMENT OF LOANS UNDER THE AID TO MINING ACT, 1927.

EXPENDITURE.

Year.	Federal Funds.			The Mining Trust Fund and Other Funds.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
1935	8,398	11	4	2,298	14	8	10,697	6	0
1936	10,462	3	7	2,807	12	10	13,269	16	5
1937	3,902	17	7	1,983	9	6	5,886	7	1
1938	3,337	2	7	1,937	1	0	5,274	3	7
1939	658	13	10	2,721	11	1	3,380	4	11
1940	866	3	5	4,188	5	4	4,984	8	9
1941	2	17	3	1,019	15	3	1,022	12	6
1942	....			1,433	3	3	1,433	3	3
1943	....			634	12	6	634	12	6
1944	....			813	9	7	813	9	7
1945	14	7	1	2,687	9	8	2,701	16	9
Total	£27,642	16	8	£22,455	4	8	£50,098	1	4

REPAYMENTS.

Year.	Federal Funds.			The Mining Trust Fund and Other Funds.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
1935	300	4	9	87	10	0	387	14	9
1936	1,286	12	5	1,078	5	11	2,364	18	4
1937	1,244	15	5	2,246	13	9	3,491	9	2
1938	3,796	4	7	422	15	3	4,218	19	10
1939	716	19	2	390	4	0	1,107	3	2
1940	599	6	2	944	3	9	1,543	9	11
1941	240	7	11	684	3	8	924	11	7
1942	357	7	10	262	11	4	619	19	2
1943	1,091	5	8	1,486	1	0	2,577	6	8
1944	233	3	2	653	16	0	886	19	2
1945	1,368	10	5	3,176	11	2	4,545	1	7
Total	£11,234	17	6	£11,432	15	10	£22,667	13	4

DRILLING.

Departmental drilling plants were in constant operation, partly on hire to the holders of mining tenements and partly in drilling areas reserved against occupation under the provisions of the Mining Act. Expenditure on all fields was £1948 3s. 11d. of which amount £390 was repaid under drilling agreements.

An extensive drilling campaign was continued on deposits of dolomite at Smithton to determine grades and volumes for an economic assessment of possibilities for industrial exploitation.

Planned boring was continued and completed on an area of alluvial ground at Herrick.

Scout boring was carried out on an area of tin-bearing alluvial ground at Gladstone.

Percussion plants were engaged in testing deposits of bauxite at Ouse and Myalla.

A small diamond-drilling plant was detailed for testing extensive limestone deposits at Ida Bay.

Diamond-drilling was resumed on the coal series at Hamilton.

DETAILS OF EXPENDITURE ON DRILLING DURING THE YEAR ENDED 31ST DECEMBER, 1945.

Plant.	Location.	Amount. £	s.	d.
Diamond Drill, No. 3	Smithon	778	15	10
Diamond Drill, No. 3	Hamilton	46	12	9
Surge Drill	Herrick	352	12	4
Surge Drill	Gladstone	244	9	5
Surge Drill	Myalla	525	13	7
		£1948	3	11

DRILLING RESULTS.

Canadian Longyear Junior Straitline Diamond Drill.

This plant was engaged by the Broken Hill Proprietary Company Limited in boring extensive tracts of dolomite in the Smithton district. Zones of high-grade dolomite were revealed and an assemblage of all relevant data is to be made for the purpose of assessing the merits of commercial exploitation.

The plant was then moved to Hamilton for a completion of a boring campaign directed to outlining the area of coal available for working at the Langloh Coal Mine.

Mitchell Air Drill.

This plant was again brought into commission and detailed to Ida Bay for the purpose of boring extensive limestone deposits concerned with the operation of the Australian Commonwealth Carbide Company.

CALYX DRILL.

Following a completion of scout bores on the coal series at Seymour, this plant was transferred to Ouse and was engaged in testing by percussion drilling, the several deposits of bauxite for the Australian Aluminium Production Commission in connection with an establishment of the ingot aluminium industry.

SURGE DRILL.

The Surge plant completed a planned programme of boring an extensive area of alluvial ground at Herrick to determine the persistence and grade of a tin-bearing lead being sluiced by the Golden Sovereign Company. The lead was proved to be narrow and of low value and as no further discovery was made in the near locality, both mining and boring were suspended.

Limited boring was then carried out on a stanniferous area at Gladstone and the results may warrant a further programme of boring when plant becomes available.

The plant was transferred to Myalla and was engaged in testing known occurrences of bauxite and in searching for new deposits. Relatively high-grade ferruginous bauxite was proved to exist but the volume outlined was not large and boring was suspended pending a detailed geological survey of the district.

Departmental Activities.

Technical services continued to be usefully directed to the economics and geology of mineral occurrences, to metallurgical research, to boring coal and metalliferous deposits, and to the general development of mining.

The value of ore-dressing innovations continues to be demonstrated by the services rendered to the industry, particularly in regard to a solution of problems affecting the metallurgy of complex ores. Useful research has been carried out in the beneficiation and utilization of non-metallic materials for the purpose of secondary industries.

Appreciating the value of research in the future development of industries additional equipment is being imported and when new analytical and metallurgical laboratories have been established and equipped in Launceston, an asset of intrinsic value will have been provided for the development of the mineral resources of the State.

The trend of markets and metal prices has been a feature of investigations in order that opportunities may be developed to rehabilitate base-metal and non-metallic projects affected by wartime controls. Favourable market avenues have been opened and an early revival of interest is anticipated in the development of silver-lead, zinc and non-metallic projects. Provision has been made for technical and financial assistance where development is merited.

Mines Drafting Branch.

The number of working plans in use and which are kept up to date is 220

Instructions issued to surveyors	43
Diagrams received from surveyors	30
Diagrams drawn on leases	228
Consolidated and other diagrams drawn	4
Lithographs entered to date	58
Various tracings prepared	50
Tracings for Launceston office	34
Manuscripts entered to date	10
Launceston working plans examined and brought up to date	12
Underground surveys examined	11
Geological plans compiled and tracings made	5

Appreciation of Services.

Appreciation is recorded of the loyal and efficient services rendered by officers of the Department, including officers of the Mining Drafting Branch, Wardens of Mines, and Registrars of the several mining districts.

Appendices.

The following reports are appended:—

Geological Survey.
Chief Chemist and Metallurgist.
Chief Inspector of Mines.
Chief Inspector of Explosives.
Inspectors of Mines and Explosives.
Mount Cameron Water-race Board.

I have the honour to be,
Sir,
Your obedient servant,

W. H. WILLIAMS, Director of Mines.

APPENDIX I.

REPORT OF THE GOVERNMENT GEOLOGIST FOR 1945.

The Government Geologist (Dr. S. Warren Carey) reports:—

Staff.

There were no staff changes. Mr. F. Blake was absent on military services. Mr. T. D. Hughes returned at the close of the year from active war service. The effective staff comprised Dr. S. Warren Carey, Government Geologist, Mr. Q. J. Henderson, Field Geologist, Mr. H. G. W. Keid, M.Sc., Field Geologist, and Mr. K. Kendall, Field Assistant.

Field Work.

The following field investigations were carried out:—

(1) Examination of the Mt. Cleveland Tin Mine:—Underground work by Mr. Henderson, surface and structural work by Dr. Carey.
(2) Extension of regional mapping in the Mt. Farrell district:—Control survey and systematic mapping by Mr. Henderson, reconnaissance to the east by Dr. Carey.
(3) Survey of the Cradle Mountain district by Mr. Keid as part of the plan for the systematic examination of the Mackintosh quadrangle.
(4) Sampling of diatomaceous earth at Andover, by Mr. Henderson.
(5) Brief examination of Tasmanian Asbestos Company's Mine at Renison Bell, by Dr. Carey.
(6) Examination of so-called "Ammonia deposit" at Trial Harbour, by Dr. Carey and Mr. Henderson.
(7) Sampling of Rhodochrosite in the Read-Rosebery Mines, by Mr. Henderson.
(8) Regional survey of the alluvial tin areas in the north-eastern corner of the State, by Mr. Keid.
(9) Selection of suitable source of high grade silica in the Ulverstone district, by Dr. Carey.
(10) Progress examination of the Clark Dam foundations at Butler's Gorge, by Mr. Henderson.
(11) Investigation of petroleum possibilities on Flinders Island, by Dr. Carey.
(12) Investigation of possibility of utilising the Killiecrankie topaz deposit on Flinders Island as a calcium free source of fluorine, by Dr. Carey.
(13) Preliminary examination of brown coal and peat possibilities on King Island, by Dr. Carey.
(14) Survey of the Risdon-Bellerive district to determine possibility of obtaining underground water supplies for town reticulation, by Dr. Carey and Mr. Henderson.

Reports were submitted on all the above subjects except the regional surveys (items 2 and 3), which were incomplete at the end of the year.

Office and Laboratory Work.

Several months were spent by Mr. Henderson on survey computations for the Mt. Farrell district control survey, and on the preparation of a full report on the Mt. Farrell Mine with details of a recommended diamond drilling programme in that area. Microscopic examination was carried out by Dr. Carey on a series of actinolite asbestos samples from the Pieman River submitted by Mr. W. B. Dallwitz; also a particle count analysis was made under the microscope of some beach sand concentrate from the Frazer River, King Island. Several parcels of osmiridium were certified, and numerous minor determinations of samples were made for callers and correspondents.

A reorganisation of the filing and index system throughout the geological survey was initiated, using the map-sheet quadrangle system introduced by the Australian Military Forces, and adopted by the Department of Lands and Surveys for its regional mapping and aerial survey programme. Rock samples, petrological slides, mineral prospects data, plans, localities, and geological literature will be filed and cross-indexed under this scheme so that the vast wealth of data accumulated during the past century is automatically accessible as required, irrespective of the memory of individuals.

A revised geological map of Tasmania and a revised map showing the distribution of mineral resources in Tasmania have been prepared, and accompany this report. Although, as far as possible, all existing information has been used in making these compilations, it should be realised that at least half of Tasmania has not been examined geologically, and much of the remainder has only been covered sketchily. Hence, no finality can be claimed for the geological map, but it is hoped that it approximates nearer the truth than earlier compilations. A compilation has also been prepared showing all important overland tracks and routes formerly in existence, their present condition with recommendations for reconditioning, and for new tracks considered desirable for the future prospecting of the mineral resources of the State. This map shows all known mines and prospects, and those areas of Tasmania so far geologically unexplored.

MT. CLEVELAND TIN MINE.

Structure of the Ore Bodies.

The tin and copper bearing pyritic ore bodies of the Mt. Cleveland Mine occur as replacement deposits in a series of slates, tuffs, and cherts, probably of Cambrian age, which are strongly folded along axes trending north north east to north east with a prevailing dip to the north west. Much faulting of a minor character is present, and it is possible that large strike faults are also present. These strata are intruded by large bodies of basic and ultrabasic rocks which outcrop extensively in the Whyte River Valley, their boundary approaching within 25 chains of the lodes. Granite is known to outcrop three miles away to the south-east and three and a half miles away to the south-west, and there may be nearer outcrops of granite in the geologically unexplored country to the south-east. "Small protrusions of porphyry" have been mentioned by Reid (1923) in the vicinity of the lodes, but the existence of these has not been confirmed.

The lodes are all of replacement type and conform to the folded structures of the sedimentary rocks, not to fractures or fissures, though a good deal of minor dislocation of the ore bodies has occurred subsequent to their emplacement. Tuffs are selectively replaced in preference to slates, and the latter have suffered intense local silicification. There is a marked tendency for the replacement to occur in the syncline. The lodes of Henry's Cut, Halls Cut, No. 12 workings, and all the Luck's Lodes (Nos. 8, 10, and 16 workings), are all developed on the troughs and adjacent limbs of synclines. It is also possible that the Battery and Smithy Lodes are opposing limbs of a slightly recumbent syncline.

Correlation of the Lodes.

As a result of structural interpretation the following correlations are made:—

Luck's Lode, which is exposed in Luck's No. 3 level and the Mt. Bischoff Company's No. 4 crosscut, is probably the same lode as that worked in No. 16 workings, No. 10 workings and the Kaki open-cut. The ore in No. 8 and No. 10 workings may be expected to meet in depth on about the 210-ft. level. If the Mt. Bischoff Company's No. 4 crosscut is extended a further 100 ft. it should cut through the same ore body again with the opposite underlay.

Luck's upper lode exposed on No. 2 level is probably the same ore body as the south dipping lodes in the No. 3 south-east drive of Luck's No. 1 level. The two limbs may be expected to meet at approximately the 330 ft. level.

Hall's lode is a trough-shaped ore body lying in the bottom of a syncline. It is not connected with either the Luck's Lodes, or Henry's Lode, or the Battery or Smithy Lodes as has been suggested. It was probably originally the same ore body as that worked in the open-cut of No. 12 workings, although the physical connection of the two has probably been removed by erosion. The Mt. Bischoff Company's No. 1 crosscut on the 260 foot level only just caught the edge of this ore body. If 20 feet lower or 20 feet further to the north-east, the crosscut would have passed beneath the lode. At its centre this ore body may be expected to cut out on about the 200 foot level.

Henry's Lode is another trough-shaped ore body on a synclinal axis. The Mt. Bischoff Company's No. 2 crosscut passed completely beneath it. A raise of 20 feet from this crosscut should find this ore body.

The Smithy Lode is the same ore body as that worked in the No. 4 workings. The ore body followed by the drive at the end of the No. 3 crosscut off the end of the No. 2 workings is the Battery Lode cut at a lower level than the old Battery workings (No. 3 workings). These two lodes are parallel and both dip to the north-west, the Smithy Lode very steeply and the Battery Lode at more moderate angles. It is possible that these two lodes are opposing limbs of an overturned syncline, and that they meet in depth at somewhere about the minus 60 level in which case they would cut out at that level or not far below.

Character of the Ore.

The lodes consist of fine grained sulphide ore with pyrrhotite as the principal mineral together with chalcopyrite, pyrite, quartz, and cassiterite. A composite sample from six samples taken across the back at 100-foot intervals along the drive below Hall's cut yielded: Tin 0·95 per cent, copper 0·39 per cent, sulphur 12·9 per cent, lead, antimony, bismuth, arsenic all nil, acid insoluble, 39·8 per cent. These analyses made by the Chief Chemist of the Mines Department, and a number of samples recorded by Reid from other workings indicate that the average grade of the sulphide lode material runs a little under one per cent of tin. Vanning assays gave a little better than 80 per cent recovery.

Ore Reserves.

Oxidized ore with secondary enrichment occurred irregularly in the upper levels of all the lodes, but has been for the most part removed. A limited quantity of oxidized ore said to be of good grade is still left in Luck's workings. Hall's Lode has been proved to the 260-foot level and 4000 tons of ore can be regarded as proved. Estimates of probable ore are as follows:—

	Tons.
Hall's Lode	100,000
Henry's Lode	7,000
Luck's Lodes	80,000
Battery and Smithy Lodes	10,000
	197,000

The total ore so far removed from the mine in past operations is 36,311 tons.

Conclusions.

As a result of this work it is concluded that the Mt. Cleveland ore bodies, being replacements on fold axes, do not persist to great depths. Also that further ore bodies are likely to occur, and would best be looked for by a magnetometer survey followed by local detailed structural examination of the areas which show magnetic anomalies.

REVIEW OF THE TASMANIAN "PORPHYROIDS."

In any regional analysis of the mineral prospects of the Mt. Farrell district, it is of economic fundamental importance to determine the relative age and relationships of the abundant igneous rocks of the district; and as these all fall into that varied group of sheared acid and subacid porphyries which have gone under the name of "porphyroids," which are of such wide occurrence in the mining fields of the West Coast, the solution of the problem is of general interest and application.

Early workers, particularly Twelvetrees and Ward, recognised extrusive, pyroclastic, and intrusive phases among these schistose rocks, and considered that they all belonged to the early Palaeozoic age. Much more recently Finucane, followed by Nye and others, recognised intrusive contacts against fossiliferous Silurian rocks and adopted the view that all or nearly all the so-called "porphyroids" were intrusions of Devonian age, and that the alleged tuffaceous and pyroclastic characters were the result of intrusion brecciation and/or dynamic crushing.

The decision as to which of these views is correct has a direct bearing on the search for new ore bodies, because, if the whole of the porphyroid rocks are intrusions more or less contemporaneous with the emplacement of the ore, a very different field for search results from what would be the case if the whole of the porphyroid suite intrusive and extrusive alike are early Palaeozoic and pre-ore, the mineralising solutions being derived from deeper igneous rocks not visible in the immediate vicinity.

A critical re-examination of the relationships of the porphyroids was therefore considered essential. As a result of this analysis the writer has concluded that each of the foregoing views contained a part truth and a part error; that the porphyroids are largely lavas, breccias and tuffs of early Palaeozoic age (pre-ore), and that they are intruded by later porphyries which were more or less contemporaneous with and intimately related to the ore; and that the shearing and hydrothermal alteration of the older effusives and the younger intrusives was contemporaneous with the injection of the younger porphyries.

Evidence of Pyroclastic Phases.

The first definite record of pyroclastic rocks among the porphyroids was made by Ward (1908, p. 17), who found tuffaceous rocks at a number of places in the Mt. Farrell district.

On the western flank of the Mt. Farrell near the south-western corner of mining lease 2409/93M near the top of the porphyroid series, in immediate contact with an amygdaloidal felspar porphyry, he describes a deep green rock with grey and reddish blotches irregularly distributed. "The varying splashes of colour are due to angular fragments, which are of different composition, some chalcedonic, others apparently fragments of pink-coloured uncrushed porphyries." Similar rocks occur near the junction of the Mackintosh and Murchison Rivers and in the nearby tramway cuttings. Under the microscope "it is still more apparent that these rocks are certainly fragmental, and yet possess many features in common with the other porphyroids." One slide contained an angular fragment of an igneous rock with a number of clear microlites with straight extinction in a perlitic glass.

In the North Dundas area, Ward (1909, p. 17), describes a similar tuff on a lower stratigraphic horizon. The rock looks like a porphyry, but under the microscope the rock is seen to consist of numerous rounded fragments of glass containing microlites, together with fragments of quartz and oligoclase all embedded in a sericite-chlorite aggregate.

Twelvetrees (1909, p. 11) has described a series of soft bedded tuffs which are interbedded with the porphyroids in the Gunn's Plains district. "Under the microscope the base appears as a pellucid glass, with numerous vesicular steam cavities. In this base is a confused mass of particles of ash and felspar microlites with occasional grains and nests of quartz." In the same area are other volcanic breccias, often gossanous and enclosing irregular tuffaceous patches with an occasional sprinkling of pyrite in a partially vitreous and felsitic base with much quartz, some of it secondary.

Twelvetrees and Ward (1910, p. 18), described fragmental rocks of pyroclastic origin interbedded with the Dundas Series of the Zeehan district. Under the microscope the tuffs consist of shattered fragments of an acid igneous rock. Some fragments consisting of partly devitrified glass containing felspar laths, represent the ground mass of the parent rock. Other fragments are broken crystals of quartz and plagioclase which represent the original phenocrysts.

Along the Lorinna Road in the Moina district, Twelvetrees (1913, p. 26), reports fragmental rocks containing felsitic and siliceous inclusions.

Loftus Hills (1914, p. 37), reports that fragmental pyroclastic types are abundantly developed in the porphyroid belt in the Jukes-Darwin area, varying from coarse volcanic breccias to fine tuffs. Coarse breccias may be "seen on the Lake Jukes track, west of Hanlon's Creek and Snake Peak, and on the Prince Darwin Section."

Reid (1918, p. 29), considers that a considerable proportion of the lower part of the porphyroid series in the north Pieman-Huskinson area is made up of pyroclastic rocks and that further tuffs occur higher in the series as intercalated beds between lava flows. The "lower beds of tuff and larger volcanic ejectamenta are usually mixed with much sedimentary material, and merge by imperceptible gradation into true sedimentary rocks."

The present writer has found abundant evidence of pyroclastic and extrusive phases widely distributed through the porphyroids. A clear exposure of the contact of two flows separated by a thin tuffaceous sandstone can be seen in the Farrell tramway cutting about half a chain west of the water tank about 17 chains west of the Mackintosh River bridge. The upper part of the lower flow contains numerous fragments of pyroclastic material which become increasingly abundant in the upper layers of the flow. A sample, which comes from the very top of this flow, is a tuffaceous lava with fragments of felsite which showered on to its surface. This is followed by two feet of friable bedded sandy tuff, which is a water redistributed rock. The next flow has a very fine-grained chilled base, which passes up into a normal porphyry at the tank. About eight chains west of this water tank there is another outcrop of a similar tuffaceous sandstone parting between the igneous rocks, but the actual contacts are not visible in this case. A sample which occurs near the top of the flow underlying this sandy tuff contains pyroclastic inclusions and is in part tuffaceous. In a cutting still further west (about 30 chains west of the Mackintosh bridge), is

another tuffaceous lava. These exposures leave no doubt that this part at least of the porphyroid belt is made up of lava flows accompanied by pyroclastic showers.

In the vicinity of the two-mile peg on the Farrell tramway are excellent exposures of coarse volcanic breccias. These are best seen if one leaves the tramline at the two-mile peg and walks up the hill. Weathering attacks the fragments differentially, so that they show up in sharp relief. In such a sample angular fragments of felspar porphyry up to six inches long are etched differentially to a depth of half an inch below the surrounding matrix, which is itself made up of smaller fragments. Some of the breccias have very coarse fragments, and in other beds the fragments are only half an inch or so long. In freshly broken faces it is often difficult to recognise the fragmental character of these rocks for they break uniformly across fragments and matrix alike. Hence, it is adways desirable to examine the weathered outcrops on the hillside as well as the fresh exposures in the cuttings. This has also been pointed out by Hills (1914, p. 37), and Reid (1918, p. 29).

Between the two-mile peg and Farrell Siding the greater part of the porphyroids are either wholly pyroclastic or are lavas containing pyroclastic material which showered on to them. Samples were collected at intervals across this section. Many of these are not visibly pyroclastic in the fresh hand specimen. However, a sample collected beside the tramline 15 chains north-west of the water tank, which is etched by weathering is made up of fragments of felsite up to two inches in length in a tuffaceous matrix. A further sample, which is a quite fresh spawl flake collected beside the tramline about 25 chains east-south-east of Farrell junction contains angular fragments of different varieties of acid lava varying from over two inches in diameter down to chips of crystals in a hard felsitic ground mass.

Many exposures of undoubted pyroclastic rocks are visible in the cuttings of the Emu Bay Railway. The most striking sample was collected beside the railway line about midway between the railway signal and watering tank on the Boco Hill two and three quarter miles from Farrell Junction (23 miles 62 chains from Guildford on Sheet 24 of the Emu Bay Railway Company's Survey). This is a coarse volcanic breccia with fragments two to four inches long of vesicular almost pumiceous lava, in a ground mass of dark blue tuff. The largest vesicles are nearly half an inch long. The rock is interesting in being much more basic than the general run of the porphyroids. It recalls the diabase breccia with vesicular inclusions described and figured by Reid (1918, p. 33), which he found in a large boulder beside the Farrell tramway near the Boco Creek bridge.

Further good exposures of pyroclastic rocks may be seen in the cuttings further up the Emu Bay Railway. In many cases the tuffaceous character is not apparent without the closest scrutiny. In some places, however, the pyroclastic nature of the rock is evident immediately it is broken. This is true for samples which were collected along the three chain straight bearing 208° 39′ between 22 miles 62 chains and 22 miles 65 chains of the Emu Bay Railway Survey.

Numerous exposures of pyroclastic rocks may be seen between the Boco water tank and Farrell Junction. For example, a rhyolite breccia with flow structure in the fragments, was collected 61 chains down the line from the tank (in the centre of the 5 chain curve 8 chains below the present 62 mile peg). A tuff with half inch pyroclastic inclusions was collected 106 chains up the grade from the Farrell Station building and a tuffaceous flow breccia from a point 88 chains north of Farrell Station.

Further evidence of the extrusive and pyroclastic nature of the porphyroids may be seen in the railway cuttings in the vicinity of Bulgobac. At the northern end of the long button grass plain south of Bulgobac, the first outcrops consist of a highly spherulitic quartz porphyry, which continues to outcrop northwards for 34 chains. In the long curve immediately south of Bulgobac Siding, a pyroclastic phase of the same rock is exposed, with angular blocks of the spherulitic quartz porphry up to three inches across set in a pyroclastic matrix. This is the top of the quartz porphyry flow, which strikes roughly meridionally and dips steeply to the east, with the railway line swinging roughly along the strike. At the northern end of Bulgobac Siding and at the water tanks the quartz porphyry again outcrops because the line veers to the west to a lower stratigraphic horizon. At the Bulgobac signal, however, where the line has veered to the east again, the pyroclastic phase again appears. The best exposures of the volcanic breccias here are found by climbing to the top of the cutting on the west side of the line at the signal, where weathering has etched the breccias differentially.

For if it is admitted that a considerable part of the porphyroid series consists of lavas, tuffs and breccias, and it seems to the writer impossible to escape this conclusion, then the current view of Finucane, Nye, and Blake that the whole of the porphyroid series is intrusive and of post-Silurian age is untenable.

Evidence of Intrusive Phases.

The existence of intrusive members among the porphyroids has been recognised by many of the workers who have investigated these rocks. Waller (1904, p. 2), mentioned "quartz porphyry dykes in the Lower Silurian slates and grits at North Dundas and at the King River and Queenstown" (Waller's term "Lower Silurian" is synonymous with the modern term "Ordovician"). Referring to the Mount Farrell field he stated that "in some cases they are undoubtedly intrusive." Later, Ward (1908, p. 2), confirmed Waller's view and reported that "On section 3263 at least the igneous rock was clearly intrusive into the slate, for tongues of igneous rock can be seen protruding into the slate." The large body of felsite and porphyry with its coarser variants of granite porphyry, granite and syenite, which outcrops on the Murchison River between Mount Farrell and Little Farrell was also regarded as intrusive.

At Gunn's Plains, Twelvetrees (1909, p. 12), reported a reddish hornblendic porphyroid intrusive into slates at the waterworks building on the Forth River.

In the North Dundas district, Ward (1909, p. 16), recognised that "there are both intrusive and effusive types present." He also stated that "it is important to distinguish clearly between the older porphyroids and the later intrusions of a more acid type—the quartz porphyry dykes, which are genetically connected with the occurrences of tin ore in the field."

In the Moina district, Twelvetrees (1913, p. 23), correlated with the porphyroids the granite porphyry of the Dove River, and the granite at Reardon's Mine. These rocks are certainly intrusive.

Hills (1914, p. 34), considered the granite of Mt. Darwin, which he correlated with the Dove River granite to be related to the porphyroids. This granite is intrusive into the felsites.

Although it is thus evident that it was clearly recognised that some members of the porphyroid group were intrusive, up until 1930 the concensus of opinion was that these intrusive members were pre-Silurian with the exception of the acid, tin-bearing dykes of the North Dundas area which were correlated with the tin-bearing Devonian granites. An important advance was made by Finucane (1932, p. 55), who pointed out that the intrusive relations were more widespread than had hitherto been recognised and that fossiliferous Silurian strata were intruded by rocks regarded as an integral part of the porphyroids. Unfortunately, Finucane's report has not been published, so I will quote in full the evidence of intrusion assembled by him:—

> "The evidence outlined above shows that the porphyries are principally intrusive rocks and that they are younger than the Dundas series, i.e., they are at least post-Lower-Ordovician. This indicates a very strong probability that they belong to the Devonian period of igneous activity. However, the only place in the vicinity of Rosebery and Mt. Read in which the porphyries are in juxtaposition to Silurian rocks is on the north-western and western slopes of Mt. Murchison. Unfortunately, no clean contacts were observed in this locality, but during and since the completion of the Rosebery survey reconnaissance trips have been made to various localities with the object of obtaining any evidence pertinent to the age of this important series of igneous rocks. A brief resumè of the total evidence now is given below—
>
> (*a*) During a reconnaissance trip to Mt. Tyndall, in June, 1932, the writer observed that the main belt of porphyries extended to within two or three chains of the foot of Mt. Tyndall, which is composed entirely of West Coast Range Conglomerate. Working along the line of contact south of Newton Creek it was noted that in many places the porphyries contained xenolithic pebbles and blocks of conglomerate up to two feet in diameter which had been derived from the adjacent conglomerates. The porphyries were quite massive and there can be no doubt that the pebbles, &c., are present as true xenoliths. Therefore, they must have been caught up during the intrusion of the porphyries.
>
> (*b*) At the entrance to the gorge in the west branch of the Queen River, the contact between the porphyries and the Silurian slates may be seen quite clearly, and is quite clean-cut and well defined. The slates

are often baked and toughened along the margin, and there are small protrusions of porphyry into the slates. Moreover, the porphyries contain small xenoliths of black slate. There can be no doubt that the contact is an intrusive one.

(*c*) In McCusick's Creek, a small tributary of the west branch of the Queen River, at a point about four chains up the left hand branch, the creek has been washed clean by sluicing. Here the contact between the Queen River porphyries and the Silurian slates may be seen quite clearly. It is quite clean-cut and well defined, though the actual line is rather irregular, there being several small protrusions of porphyry into the slates. The rocks are brecciated along the contact and the porphyries contain innumerable fragments of slate. This occurrence has been described by Gregory as a fault breccia, but, when considered along with the occurrences in Lynch Creek, the weight of the evidence favours contact-brecciation. Moreover, the porphyries are quite massive a few feet from the margin and there are no minor fault planes such as one would expect to see along a fault of any magnitude.

(*d*) In Lynch Creek, Lynchford, at a point about 40 chains above the King River Mine, a large xenolith-like block of slates and indurated sandstones occurs wholly within massive porphyries. This block is 10 to 15 chains wide and about half a mile long. The slates and sandstones are generally similar to those of the Silurian rocks occurring to the west and have probably been derived from intruded Silurian strata. In addition to the one large block, innumerable smaller fragments may be observed in the porphyries at various points along the creek. The observations in McCusick's and Lynch Creeks and in the west branch of the Queen River were made in November, 1932, and June, 1933.

(*e*) In June, 1931, while examining the upper reaches of the Henty River, south of Mt. Dundas, Mr. F. Blake found Silurian rocks occurring on both sides of the southern extension of the porphyries from Mt. Read. The field relationships indicated that the porphyries were intrusive into and younger than the Silurian rocks.

(*f*) On Madam Howard Plains, west of Queenstown, Blake had obtained similar evidence in 1928, though its importance was not then realised. In that locality, syenites, similar to some of the Queen River porphyries, are intrusive into fossiliferous Silurian slates and sandstones.

(*g*) On the north-western slopes of Mt. Murchison, about six miles south-east of Rosebery, pieces of sheared porphyry were found to contain fragments of West Coast Range Conglomerate. The occurrence is generally similar to that at Mt. Tyndall, but on a smaller scale. The specimens were obtained close to the porphyry-conglomerate contact.

(*h*) In the Mt. Claude district, there is a quartz porphyry dyke on Thomas' Road, which is quite definitely intrusive into Tubicolar sandstones (Silurian). This occurrence is again referred to below.".

The foregoing statement establishes beyond doubt the fact that intrusive members are present in the porphyroid group and that fossiliferous Silurian strata are also intruded.

Evidence of Pre-Ordovician Erosion of the Porphyroids.

Professor Gregory (1905, p. 80), considered that the porphyroids were older than the West Coast Conglomerate because of the frequent occurrence of pebbles of the Lyell Schists (porphyroids) in the conglomerates. Finucane (1932, p. 56) questioned Gregory's statement on the grounds that there had been confusion in Gregory's references between the schists of the porphyroids and older mica schists and quartz schists in the Pre-Cambrian.

However, Loftus Hills (1914, p. 41) advanced strong and convincing evidence of a period of erosion of the porphyroids before the West Coast Conglomerates were deposited. In the Jukes-Darwin district a breccia-conglomerate (called by Hills "brecciated conglomerate," though it is clear from the text that breccia-conglomerate is meant) is almost invariably found at the base of the West Coast Conglomerate series. This breccia-conglomerate "consists of a varying thickness of beds composed of angular, sub-angular, to partially rounded fragments of those members of the porphyroid series which are developed in this field, including, *inter alia*, fragments of the Darwin granite. Some fragments of quartz and quartzite are also present, but only in subordinate amount, the predominant constituents being the porphyroids. These fragments are cemented together by a paste of the finer particles of the same rocks. The size of the constituent fragments varies from masses approximately four feet in diameter down to the finest material forming the cementing paste." At the northern end of Mt. Jukes they rest "unconformably on the upturned edges of the porphyroids and show a distinctly stratified arrangement en masse." The breccias pass laterally and upwards into normal West Coast Conglomerates and in the transition zone there is interbedding and interdigitation of the two types.

Finucane, discussing this evidence (1932, p. 57), says: "This would constitute indisputable evidence of the pre-Silurian age of the porphyroid series if it did not clash as it does, with the evidence which places the porphyroids as post-Silurian." Finucane had a thin section cut of one of the pebbles in a specimen of conglomerate collected by Hills and concluded that it was "probably a highly sheared quartz porphyry."

Nye, Blake, and Henderson (1934, p. 48), who encountered what is undoubtedly the same formation in three localities at the base of the West Coast Conglomerates in the Mount Lyell district, were of the opinion that these breccia-conglomerates occurring as they do "between the quartz felspar porphyries and the coarse members of the West Coast Range Series, are the result of the intrusion of the former into the latter . . . The quartz felspar porphyry magma was of such a composition and nature that it could intrude conglomerates, partly assimilating and replacing them, thus giving pebbles of quartz porphyry in a ground mass of similar character." It is also suggested that the breccia-conglomerates described by Hills had a similar origin, and Hills' description of the transition from the breccias to normal conglomerates by the gradual elimination of the porphyroid pebbles in favour of quartz and quartz schist pebbles, is interpreted as further evidence of selective hydrothermal replacement of the former pebbles by quartz porphyry and quartz felspar porphyry. Nye and his co-authors added that they realised that it was an unusual occurrence and put forth their views with some hesitation.

It is fairly evident that this interpretation of the breccia-conglomerate was forced on these authors, not because the outcrops do not look like true conglomerates, for their own description makes it clear that they do, but because of their initial conclusion, following Finucane, that the whole of the porphyroids are of Devonian age and intrusive into the Silurian. Hence, a basal conglomerate, or breccia, at the bottom of the West Coast Conglomerates containing pebbles of the porphyroids had to be explained away or the main conclusion abandoned. The explanation offered is inherently unsound. For, although it is quite possible for a quartz porphyry to invade a conglomerate and assimilate it, or bodily replace it by quartz porphyry, or selectively replace the original pebbles by hydrothermal minerals, it is manifestly impossible for it to replace the pebbles alone by quartz porphyr and quartz felspar porphyry. The latter can only be produced by high temperature crystallisation of the phenocrysts and lower temperature solidification of the groundmass, and could not be produced by selective replacement processes.

Dr. W. R. Browne, who later examined some of the exposures in the Mt. Lyell district wrote (1939), in a letter to the then Acting-Government Geologist: "I had sections cut of the matrix and pebbles of the sheared conglomerates at King River Bridge, and the former appeared to be tuffaceous, or at all events fragmental, while the latter are definitely acid and intermediate volcanic rocks—rhyolites and andesites. I can't help thinking on this evidence, such as it is, that the conglomerate is a tuffaceous one, and that, whatever its age, there were andesites and rhyolites in existence before it was formed."

Reid (1919, p. 25), reported the presence of boulders of porphyroids in the West Coast Conglomerate towards the summit of Mt. Claude. This evidence is disputed by Finucane (1932, p. 57), on the grounds that though the "large reddish pebbles and boulders closely resemble some of the reddish quartz felspar porphyries which occur in the vicinity" they are really felspathic grits and not felspar porphyries. Since the porphyroids contain abundant breccias, tuffs, and fragmental rocks it would still seem probable that the pebbles were derived from the porphyroids.

The present writer has seen scarce, but nevertheless, positive pebbles of quartz porphyry in the basal bed of the West Coast Conglomerate at Mt. Farrell. It would seem, however, that except in the special localities such as the Jukes-Darwin-Lyell district, where local islands of porphyroid must have been subjected to erosion, the porphyroids were for the most part submerged during the deposition of the West Coast Conglomerate and hence protected from erosion.

However, there is fairly widespread evidence that the porphyroids were also subjected to erosion in an earlier interval before the deposition of the West Coast Conglomerates. In the upper part of the Farrell slates formation which separates the porphyroids from the West Coast Conglomerates, Ward described (1908, p. 20), a series of sheared conglomerates. These are well exposed in the Murchison Gorge at the northern end of Mr. Farrell and have been examined by the writer. They contain pebbles of acid and intermediate lavas and of quartz in a sheared sericitic and chloritic matrix, which makes up the greater part of the rock, and which as Ward mentions, is difficult to distinguish from some of the sheared porphyroids. Similar sheared conglomerates have been examined by the writer in the Nietta district, half a mile south-west of the Loongana Road bridge across Jeanbrook Creek. The pebbles are waterworn and consist largely of acid lavas and vary in size up to three inches. Smaller pebbles of quartz are also present. The matrix is either tuffaceous or has accumulated from the redistribution of tuffaceous material. The beds are well stratified, some bands being free from pebbles. Over one thousand feet thickness of these beds was seen by the writer, but this did not include either the bottom or the top.

Reviewing the foregoing evidence it seems impossible to escape the conclusion that the porphyroids or part of them were subjected to erosion during the time of deposition of the Farrell slate series, and again in certain restricted localities at the beginning of the deposition of the West Coast Conglomerates.

Summary of Evidence on the Age of the Porphyroids.

In the preceding review the following facts have been established:—

(1) The porphyroids contain lava flows.
(2) A considerable proportion of the porphyroids especially in the lower half consist of pyroclastic breccias and tuffs.
(3) The porphyroids suffered erosion and contributed to conglomerates at the top of the Farrell Series and at the base of the West Coast Conglomerate Series.
(4) Intrusive members are present, some of which intrude also fossiliferous Silurian sediments.

It is therefore apparent that neither the old school which considered the whole of the porphyroids to be of early Palaeozoic age nor the newer school which considered the whole of the porpyhroids to be Devonian intrusions can be completely supported. Both schools were wrong in assuming, for it is merely an assumption, that the whole of the porphyroids were but a single series. It is now quite evident that two groups of rocks are present, the porphyroids proper, which include all the lavas and tuffs, and breccias, which make up the greater part of the series, and the Devonian intrusive porphyries, which are prominent at Queenstown, Rosebery, and at the northern end of Mt. Farrell, and again in the Moina district. So far as the writer is aware there is no recorded factual observation concerning these rocks which is in conflict with this conclusion.

Thus is vindicated a view expressed over 30 years ago by the late Professor David:—

> "If the porphyroids are largely contemporaneous tuffs, one fails again to see how they can intrude anything; and if they include an intrusively behaving member . . . in their series, is not that member an intruder in the porphyroid series itself, and therefor probably later than the porphyroids in age" (from a letter to Twelvetrees, quoted by Twelvetrees, 1913, p. 15).

With regard to the age of the porphyroids proper, it is now clear that they overlie the Dundas Series with apparent conformity and underlie the Farrell Series and the West Coast Conglomerates. The Dundas Series contain fossil dendroids, which are regarded by Thomas and Henderson (1944) to be of Middle Cambrian age, as well as the worm *Tasmanadia twelvetreesi*, and the phyllocarid *Hurdia davidi*, also of Cambrian (probably Middle Cambrian) age. There are no other authenticated fossils. The porphyroids are therefore probably not older than Upper Cambrian. The West Coast Conglomerates are not fossiliferous, but lower Ordovician (Tremadocian) trilobites and Piloceroid cephalopods occur near Railton and Adamsfield in the beds immediately overlying the conglomerates, hence the West Coast Conglomerates are not newer than Tremadocian and are themselves probably basal Ordovician (see also later). Hence the porphyroid series, the Farrell Series, and the diastem represented by the unconformity between the Farrell Series, and the West Coast Conglomerates, together make up the Upper Cambrian.

GEOLOGICAL SUMMARY TO ACCOMPANY NEW GEOLOGICAL MAP OF TASMANIA.

Pre-Cambrian Cycle of Sedimentation (Davey System).

The oldest rocks known in Tasmania are a thick series of quartz schists, mica schists, and quartzites with some stretched pebble conglomerates. Zoisite amphibolites on the Rocky River, Collingwood River, and elsewhere, are grouped with this series. No outcrops have been found of the basement on which these old sediments rest or the rocks from which they were shed. This Pre-Cambrian system which is coloured brown on the map, has been strongly folded and recrystallised under regional metamorphism, but shows little contemporaneous or subsequent igneous activity or thermal metamorphism. On the evidence of their metamorphic grade it has been accepted that this system is separated from all subsequent systems by a major unconformity, although no unconformity against the succeeding Cambrian strata has been observed in the field. Apart from undeveloped iron ores these old rocks have not proved fertile hosts of economic minerals. However, two small mining fields (the Jane River Goldfield and the Cox's Bight Tinfield), do occur in these rocks.

Cambrian Cycle of Sedimentation: Pieman System.

The second cycle of sedimentation (shown in purple on the geological map) probably started in the late Pre-Cambrian, but extends well into the Cambrian. A thick series of dolomites (shown in barred blue about Smithton) also belongs to this cycle, and dolomites are recorded from the Arthur Valley and south of Macquarie Harbour. Tillite occurs on the east coast of King Island in the vicinity of City of Melbourne Bay, where it is overlain by laminated dolomite thought to be dolomitised varves which is followed in turn by a thick suite of volcanic rocks. The Dundas Series consists of purple slates, dark slates, and quartzites and contains also a peculiar breccia horizon. Cambrian dendroids and hydroids (Thomas and Henderson 1944), and the worm *Tasmanadia* (Chapman, 1928), and the phyllocarid Hurdia (Chapman, 1925), have been described from this series, but earlier records of graptolites have now been discredited (Thomas, 1944). Volcanic phases with spilites, tuffs, and breccias are present within the Dundas Series, which passes conformably upwards into a thick volcanic suite of sheared keratophyric lavas, tuffs, and breccias, which have been referred to as "porphyroids." This series is complicated in some areas by subsequent injection of Devonian porphyries along shear zones. Conformably overlying the porphyroids are the Farrell slates, which pass upwards into schistose conglomerates containing pebbles of volcanic rocks, probably derived from earlier Cambrian lavas. The strata of this long cycle are strongly folded, crumpled, and faulted, but regional metamorphism is of a distinctly lower grade than in the underlying Pre-Cambrian rocks. Contact metamorphism has occurred around intruding batholiths and silicification around some of the basic intrusions, and intense shearing and hydrothermal metamorphism has occurred particularly in the volcanic rocks adjacent to later porphyry injections. The strata of this cycle are the principal host rocks for ore bodies in western Tasmania.

Ordovician Cycle of Sedimentation: Junee System.

The third cycle of sedimentation of Ordovician age (all the blue colouring except the Smithton dolomites, commences with the West Coast Range Conglomerate, a coarse hard boulder formation now silicified and stained pink with haematite. This Ordovician cycle is unconformable on the Cambrian. A basal breccia with blocks derived from the Cambrian sequence is developed locally in the vicinity of Mt. Darwin. Included in this breccia are boulders of the Darwin granite, which is intrusive into the Cambrian. However, the evidence, generally, does not suggest a major diastrophism between the Cambrian and the Ordovician. The West Coast Range Conglomerate passes up into white or pink quartzites, which are followed conformably by sandstones and shales with Tremadocian Dikelocephalid trilobites (Adamsfield, Junee, and Caroline Creek). At Adamsfield, not far from this horizon, occurs also a rich cephalopod fauna with more than one species of Piloceroid. Overlying the trilobite beds are dark blue limestones containing a varied fauna of cephalopods, gasteropods, brachiopods (particularly Orthids), and corals (including *Tetradium*). There is some evidence that this limestone, which certainly commences in the Ordovician, persists through with no great thickness more or less continuously into the Silurian as indicated by the presence of such forms as *Hercophyllum shearsbyi*, but it is not certain that only one limestone is involved. A difference of opinion also exists in respect to the conglomerates, some workers (e.g., Thomas, 1944), holding the view that the conglomerates east and north of the

Pre-Cambrian core are Tremadocian (Adamsfield, Junee, Railton), while the conglomerates west of the core are Silurian. The writer's view is that the conglomerates are all basal Tremadocian and represent a gravel girdle surrounding the Pre-Cambrian core then emergent, from which the pebbles are certainly derived. The fossil evidence establishes the age of the eastern and northern conglomerates as underlying the fossiliferous Tremadoc. and overlying unconformably beds lithologically correlated with the fossiliferous Cambrian. The western conglomerates overlie with unconformity fossiliferous middle Cambrian and are followed by fossiliferous Silurian. These conglomerates are all similar in their lithology, which is distinctive, and they recur at intervals throughout the belt between Railton, where they underlie Tremadocian fossils, and Queenstown.

Siluro-Devonian Cycle of Sedimentation.

The middle Palaeozoic cycle of sedimentation (neutral tint) is represented in two distinct provinces, the Eldon Series in the west and the Mathinna Series in the north-east. The Eldon Series (more widely known as the Queen River Series, which term, however, should lapse on grounds of priority, as pointed out by Thomas), is transgressive over the western region, sometimes resting with apparent conformity on the West Coast Conglomerates or Gordon River limestones, but elsewhere transgressing unconformably on to the Cambrian or Pre-Cambrian. The series consists of sandstones and shales with richly fossiliferous zones. The fauna has been regarded as of Silurian age, but recent workers (e.g., Thomas, 1944a, and Gill, personal communication), have independently claimed a Devonian age on the evidence of *Pleurodictyum* and certain Chonetid brachiopods. No strong folding or igneous injection occurred between the Ordovician and this Siluro-Devonian sedimentation, but a violent epoch of strong diastrophism, igneous intrusion, shearing, and metallogenesis followed this sedimentation.

Meanwhile the Mathinna Series, which consists of a thick succession of slates, tuffs, and quartzites, all of geosynclinal facies, was accumulating in the north-east. These rocks differed from the Eldon Series, in that, whereas, the floor of Ordovician, Cambrian, and Pre-Cambrian rocks on which the Eldon Series was deposited is everywhere apparent, the Mathinna Series was a true geosynclinal facies, and no floor of older rocks has anywhere been seen. This thick series seems to be devoid of marine fossils, but a few plant remains of the *Hostimella* type have been found, and suggest a Siluro-Devonian age. Like the Eldon Series, the Mathinna Series sedimentation was closed by violent diastrophism, bathylithic injection, and metallogenesis.

Carboniferous Peneplanation.

Next ensued a prolonged period of erosion lasting about until the close of the Carboniferous, during which time a general peneplain was developed. But, although this erosion interval was long enough to reduce existing mountains, it was not long enough to destroy the capacity of the mountains for isostatic regeneration. Accordingly, although most parts of the State were submerged in the transgression that followed, the capacity of the sea floor to subside was very unequal, with the result that the thickness of sediments varied considerably in different regions.

Permo-Triassic Cycle of Sedimentation.

This fifth cycle of sedimentation commenced in the lower Permian (possibly late Carboniferous) and continued with diastems to the end of the Triassic. Owing to the widespread violence of the Devonian orogeny and the ensuing period of erosion, the Permo-Triassic strata everywhere rest with violent unconformity on the older rocks. The cycle begins with tillite resting on a glacially striated pavement at Wynyard. This gives place to marine mudstones, limestones, and shales with a Permian fauna, which are interrupted by a coal and oil shale interlude, and are followed by further coal measures with *Glossopteris*. Triassic quartz sandstones succeed the Permian with disconformity, and are followed by shales with *Thinnfeldia* and *Phyllotheca* then more quartz sandstones, then productive coal measures associated with a rich Rhaetic flora with *Cladophelbis*, Cycads, and Ginkgoales. The coal measures are followed by thick arkosic sandstones, which closely resemble and may be coeval with the felspathic sandstones of Gippsland, Victoria, which contain a Jurassic flora. This cycle of sedimentation was terminated in the Jurassic by stupendous injections of dolerite, which warped and dislocated the Permo-Triassic rocks and resulted in a land surface of considerable relief.

The Late Mesozoic Peneplanation.

The next 90 or so million years, from the Jurassic into the lower Tertiary saw stable conditions with prolonged erosion and the development of a great late Mesozoic peneplain, on the surface of which a lateritic and in places bauxitic crust was formed during desiccating epochs of the lower Tertiary climate.

Tertiary Origin of Present Topography.

The late Mesozoic peneplain was broken up in the Miocene by a great series of fractures with a north-north-westerly trend along which some blocks were uplifted forming escarpments and others were tilted forming structural valleys. This trend is reflected in the prevailing topographic grain of Tasmania as expressed by the Derwent Valley, the Western Tiers, the Tamar, South Esk, and Macquarie Valleys, Macquarie Harbour, and the lower Gordon, and the west coast and western continental shelf. This trend is oblique to the tectonic grain of Tasmania, which tends to be more nearly meridional. Following the faulting, the depressed areas without exterior drainage became freshwater lakes. As such a line of lakes overflowing from one to the other down a structural valley the Derwent River was born. The Launceston Tertiary Basin now drained by the South Esk, Macquarie and Meander Rivers had a similar origin and so did Macquarie Harbour. The freshwater lakes rapidly filled up with sands and clays in which the sub-tropical flora of the times contributed its leaves and fruits. Overlying these lake sediments are widespread Pliocene basalts. There are also earlier basalts which may have been contemporaneous with the initial break up of the peneplain.

Pleistocene Landscape Sculpture.

The Pleistocene glaciation saw about a third of Tasmania under ice, and cirques, glacially formed lakes and tarns are a common feature of the highlands. The poorly drained button grass plains which are so conspicuous a feature of the south-western half of Tasmania are largely on glacial debris. Eustatic changes of sea level during the last million years have had a profound effect on the coast line, and have been responsible for the drowning of all the major estuaries, the flooding of Bass Strait, and dune development on shores exposed to the westerly gales.

Intrusive Rocks.

A small body of granite thought to be of late Cambrian age occurs at Mt. Darwin. Certain other granitic rocks in Tasmania may belong to this epoch. The extensive granite of western Tasmania are Devonian, and the granites of the north-east and the Furneaux Group are probably Devonian also. Some evidence suggests that two Devonian granite epochs are developed in Tasmania, one of early and the other late Devonian or lower Carboniferous age. This question is referred to again below in connection with the mineral deposits. Most of the ore bodies of Tasmania were introduced during these Devonian eruptions. Pre-granite pyroxenites and serpentine are widely distributed usually in Cambrian country into which they introduced osmiridium and some gold. They have been regarded as of Devonian age, but some evidence suggests they may be older. Widespread stratiform and transgressive sheets of dolerite invaded the Permian and Triassic probably during the Jurassic. Alkaline syenite with many cognate variants intrudes the Permian and the Jurassic sills at Cygnet. It is of late Mesozoic or early Tertiary age, and has introduced a little gold.

Structural Features.

The most fundamental feature of Tasmania is the Pre-Cambrian core trending from Port Davey northwards to Cradle Mountain. This was folded during the late Proterozoic and has not suffered strong folding since, although it is flanked on east and west by strongly folded belts of lower Palaeozoic sediments. This core has been generally emergent ever since the Cambrian. It supplied gravels to form the West Coast Conglomerate during the lower Ordovician, and was an area of minimum subsidence during the Permian and Mesozoic transgressions. It suffered maximum uplift during the lower Tertiary movements and at present contains some of the highest and most dissected country of Tasmania.

The dominating structural feature of the State is the great composite intrusion of dolerite which extends through the greater part of the island. The dolerite burst through the basement in the Midlands and spread out laterally through the Permian and Triassic strata, sometimes concordantly, often discordantly, sometimes at the basal unconformity of the Permian, more often higher

up, often on more than one horizon, preserving a general sill-like character in spite of many transgressive contacts. Remnant outliers show that the sheet extended originally to the West Coast Range and north-east to Banks Strait. Towards the margin the intrusion was generally concordant.

Notes of Distribution of Economic Minerals in Tasmania.

New Mineral Map.

Accompanying this report is a new map showing the distribution of the principal economic minerals known in Tasmania. So far as the scale will allow, every mineral prospect on record in the Geological Survey is indicated by the appropriate symbol. In some of the more richly metalliferous areas it has not been possible to show every known prospect. Wherever a productive mine has developed this is indicated by ringing the prospect with a circle. Where the mine has been subsequently abandoned, or is not at present operating, ticks are added to this mine symbol. Over a large part of the State the surface rocks belong to formations younger than the metallogenetic epochs which introduced the ores. In these areas the chances of finding lodes at or near the surface are remote, but it should be clearly understood that stratified deposits such as coal, oil-shale, and limestone and residual deposits such as bauxite may and do occur in the areas; and, also, that alluvial deposits may occur where detritus is shed from a favourable area.

Within the known metalliferous areas, lines have been drawn in appropriate colours grouping together mineral occurrences which are genetically related. Many non-metallic products such as clays of several commercial types, ochres, sands, and silica, and building and monumental stones have been omitted even though some of them are of considerable potential value. Minor metals such as antimony, beryllium, bismuth, cadmium, cerium, cobalt, magnesium, manganese, mercury, and thorium, some of which occur as valuable by-products in the recovery of other minerals and some of which would be developed on their own account have also been omitted.

Mineral Belts of North-East.

The mineral prospects in the north-east are distributed in two clearly defined zones, which suggest that there are two independent epochs of metallogenesis in this region. The red line shown on the map defines the tin belt, which takes in all the granite areas on Flinders Island, Cape Barren Island, the Ringarooma Valley, Mt. Cameron, and the Blue Tier. Outliers of this tin granite occur at Storey's Creek and Roy's Hill and southward extensions are covered by younger rocks, but reappear on the Freycinet Peninsula. The granites of this area are commonly coarsely porphyritic with felspar phenocrysts up to three inches long; but fine grained granites and greisens also occur and it is these that carry the tin (see Thomas, 1943b). Quartz reefs in the contact aureole carry cassiterite and wolfram, as at Storey's Creek and Aberfoyle, and the Fly-by-Night Mine at Gladstone.

Sharply contrasting with the tin granites, is the granitic mass about Scottsdale, of which Mt. Stronach is the best known peak. This granite, subsidiary bosses of which extend northwards to Mt. Horror and towards Waterhouse Point and eastwards to Lisle and Lilydale, is a granodiorite rather than a true granite, and is conspicuously free from tin and tungsten; from the extensive granitic area itself no lode matter has been reported, except a molybdenite prospect at Mt. Stronach. But the country rocks in a broad girdling belt round the granodiorite contain auriferous quartz reefs. This gold belt which includes the Waterhouse, Warrentinna, Mangana, Mathinna, Burns Creek, Lisle, Lefroy, and Beaconsfield goldfields, contains free milling quartz lodes in the upper few hundred feet with primary sulphides such as pyrite, arsenopyrite, and chalcopyrite, and to a lesser extent galena, stibnite, and sphalerite present at depth as lower grade ore. There is no doubt that a considerable area of this auriferous province is concealed beneath the Permo-Triassic sheet of sediments and dolerites east of the Tamar and the South Esk.

There is perhaps reason to look for local placer streaks of auriferous conglomerate in the basal beds of the Permian in this region. Likewise, it is not impossible that tin in payable quantities may occur locally in similar situations in the basal Permian grits around Aberfoyle, Roy's Hill, and the Freycinet Peninsula.

In separating the tin and the gold provinces of the north-east and their parent igneous rocks, the question arises of the position and relationships of the Eddystone-Mt. William granitic mass in the extreme north-east (see geological map) and of the line of small gold mines running from the Grand Flaneur through the Blue Bell and the Portland to McGowan's shaft. So far no tin has been recorded in association with this granite, and the adjacent gold prospects are free milling quartz reefs with primary sulphides at depth similar to the auriferous reefs of the other provinces. Hence, there is a temptation to correlate the Mt. William granite with the Mt. Stronach intrusion rather than the Mt. Cameron intrusion. But, on the other hand, this granite is said to resemble lithologically the coarse porphyritic granite of the tin province.

Another island zone is the group of copper prospects near Scamander. These are associated with small intrusions of granodiorite, which has border phases of hypersthene-bearing granodiorite (Twelvetrees, 1911). These masses are outlying bosses from a larger granodiorite mass in the St. Marys district, which also has pyroxenic phases. The lodes are quartz reefs with arsenopyrite, chalcopyrite, and galena, and at the Scamander Silver Mine carry silver and gold with secondary enrichment in the oxidized zone. The whole set up of the group of lodes and the character of their parent igneous rocks links them with the Mt. Stronach gold province as distinct from the Mt. Cameron-Blue Tier tin province. The two provinces come very near one other at the Great Pyramid Tin Mine, but there is no confusion or overlapping of the lodes.

The foregoing discussion suggests that there were distinct epochs of granitic intrusion and metallogenesis in the north-east of Tasmania, one bearing gold and some copper, zinc, silver, lead, and molybdenum, and the other introducing tin and tungsten. The geographic evidence suggests that this differentiation is not merely one of thermal zoning. In the past it has been generally accepted that all Tasmanian ore bodies were the result of a period of intense granitic and ultra-basic intrusion of Devonian age, but critical review makes it clear that this view involves much unwarranted assumption. So far as the north-east is concerned, the ore bodies are probably all Post-Silurian and were emplaced sufficiently long before the beginning of the Permian to permit extensive peneplanation. However, there still remains a considerable interval of time within these limits. Dr. W. R. Browne has suggested that the granodiorite intrusions with their associated arsenical gold quartz veins and copper, &c., and their tendency to carry hypersthene may be of late Middle Devonian age, and referable to the epi-Yeringian magmatic epoch of Eastern Australia, and that the tin granites may be of late Lower Carboniferous age and referable to the Drummond epoch of Eastern Australia. There is a good deal to be said for such a view and I find nothing in the Tasmanian evidence to gainsay it. A systematic petrological study of the plutonic rocks of north-eastern Tasmania might yield much information of economic as well as academic value.

Western Mineral Belts.

A conspicuous feature of the West Coast region is the zinc-lead sulphide belt extending from the Pinnacles southwards for 30 miles through Rosebery and the Hercules to the Old Queensbury Mine. This belt is associated with sheet like intrusions of Devonian felsite and porphyry into Cambrian keratophyric lavas, breccias, and tuffs; the intrusion was accompanied by strong shearing, which affected the intruding rock even more than its host, and by hydrothermal alteration. In the resultant complex of quartz sericite schists and chlorite schists which have been grouped under the general term "porphyroids," it is difficult to distinguish the Cambrian volcanic rocks from the subsequent porphyries. The lodes are replacement bodies with sphalerite as the principal ore mineral and galena and chalcopyrite as important constituents. Gold and silver are present. Extending for about ten miles on either side of this zinc-lead sulphide belt are zones carrying silver-lead ore bodies.

An important belt of copper sulphide lodes and disseminations extends for nearly fifty miles northwards from Kelly's Basin to near Tullah. Included in this group are the important Mt. Lyell ore bodies. Right along this belt the ore bodies are closely associated with fairly large intrusions of hypabyssal rocks injected during folding and faulting movements. A number of iron prospects are shown in this belt, but these are rather heterogeneous, some being gossan caps of pyritic bodies and others being magnetite segregations (e.g., south end of Findon's). Gold is present in the primary sulphide and has contributed much to the value of the Mt. Lyell production. It has also been mined in gossan enrichments (e.g., Harris' Reward), and as small derivitive alluvial concentrations.

Taking the broad view of the West Coast mineral province, the distribution of the copper, zinc, silver, and lead lodes is in accord with a general thermal zoning. This view was long ago expressed by Ward (1902), but is not universally accepted by geologists interested in the area to-day. However, the Darwin-Lyell-Murchison copper belt coincides with the zone, where large hypabyssal intrusions of porphyry are exposed at the surface. The Pinnacles, Rosebery, Queensbery zinc belt coincides with the zone where smaller intrusions reach the surface under conditions of more shearing and hydrothermal solutions and less actual magma, as compared with the copper belt. Between these two and again west of the zinc belt, the lodes are mainly silver-lead, while further westwards zinc is on the increase again. This picture is over simplified, but is capable of amplification on larger scale study.

Ward went further and included the tin at Heemskirk and Renison Bell as the high temperature phase of this same sequence. However, while this may prove to be correct, other views seem not impossible and some caution is desirable. Thus Dr. Browne has tentatively suggested that the non-sheared tin granites here as in the north-east may be distinctly later than the sheared intrusions which introduced the copper, silver, and lead.

The tin fields themselves fall into two classes, one consisting of quartz cassiterite lodes and disseminations, and the other of cupriferous sulphide bodies. The first group include the concentrations about Mt. Heemskirk, and Parson's Hood, where the tin is directly associated with broad outcrops of unsheared porphyritic granite. Stanniferous greisens and quartz tourmaline nodules have contributed to the production. To the second group belong Mt. Cleveland, Mt. Lindsay, and the Renison Bell-Colebrook clusters of ore bodies which possess a number of peculiarities which brand them as cognate. These ore bodies are mainly simple replacements of folded sediments, and hence, many of them are flat-lying or occupy the troughs of sharp synclines and hence do not persist indefinitely in depth. The tin ore is of a sulphide type with pyrrhotite as the dominant mineral and with chalcopyrite as a common accessory. The tin is of very fine grainsize and is partly in the form of stannite. The bodies are of relatively low grade, but of large size, and represent considerable tonnages of tin. Valuable secondary enrichment gossans occur in the oxidized zone. A striking fact is that all these ore bodies are closely associated with ultra-basic rocks. This may be merely a coincidence, but since pyrrhotite and particularly cupriferous pyrrhotite are common magmatic segregation products from ultra-basic rocks, the possibility suggests itself that these tin-bearing cupriferous pyrrhotite bodies may be genetically related to the basic rocks, which if substantiated would constitute an unusual association for tin. The common occurrence of axinite and actinolite in these ore bodies also accords with this suggestion. On the other hand dykes of quartz porphyry do occur at Renison Bell and quartz porphyry has also been recorded by Reid (1923) at one spot at the Mt. Cleveland Mine, but I was unable to find any on my visit.

Mt. Bischoff has much in common with these stanniferous sulphide bodies. There was a rich and extensive oxidized cap, now mostly removed, but the primary ore is pyritic and of replacement type, although the tin is coarser than in the other pyritic bodies. Dolomite is abundant and is regarded as an end product from the alteration of serpentine. However, in addition to the replacement bodies there are important lodes of the fissure vein type. Also quartz porphyries are more abundant and these show evidence of intense pneumatolytic action with extensive topazisation.

The cluster of copper bearing sulphide bodies near Barn Bluff has many features in common with the foregoing stanniferous sulphide group and may well be cognate.

The Moina group of mines and prospects in the Forth Valley offers a wide diversity of minerals which at first sight suggests a thermal zoning pattern with tin tungsten and bismuth principally occurring in and around the Dolcoath granite and gold, silver, lead, and copper more widely distributed through the country rock. However, the question arises of the relation of the Dove River and Dolcoath granites and the relation, if any, of the former to the ore bodies. Here again there is the association of an unstressed granite carrying tin and tungsten and a sheared granitic rock in a broad gold, silver, lead, zinc field.

Another belt of considerable interest is the zone of copper-iron prospects which extends meridionally for 20 miles from Specimen Reef through Rio Tinto across the Savage River to the Pieman. This appears to consist of pyritic bodies of impressive dimensions. At depth the primary lodes are probably all pyritic with pyrites and chalcopyrite. Extensive caps of gossan and magnetite have formed near the surface as a result of deep oxidation. Secondary enrichment of gold has occurred, and this has been shed to the several payable alluvial accumulations along the Savage River, where much of the gold is coarse. This important zone has certainly not received the attention it would appear to deserve from prospectors or geologists. Difficulty of access, dense vegetation, and high rainfall seem to have been the principal obstacles, but these have been surmounted elsewhere. Indeed, there is an extensive area of potential mineral country between the Pieman and the Arthur Rivers which merits thorough examination.

A mixed group of prospects occurs in the vicinity of the Dial Range. These include chalcopyrite lodes associated with the Housetop granite, Cambrian stratified haematites at the Blythe River, Ordovician haematite pebble conglomerates in the Dial Range, magnetite segregations in basic rocks at Hampshire, and tin and silver-lead associated with the granite in this same area. Argentiferous lodes also occur on the coast near Penguin. Further work is warranted in this region, but much of the surface is covered by Tertiary basalt. There is little doubt that the richly mineralised zones of the West Coast extend continuously beneath the basalt to the north coast between Ulverstone and Burnie.

A marked feature of the mineral distribution map is the way in which the evidence of mineralisation cuts off suddenly along a line through Trial Harbour and Kelly's Basin. North of this line there is a dense swarm of mineral prospects and mines. South of this line there is practically nothing. Insufficient search and the covering of Tertiary sediments along the north-east shore of Macquarie Harbour do not supply the whole answer, and early Tertiary faulting seems to be a contributing factor. This north-west to south-east trending faulting which broke up the late Mesozoic peneplain in the lower Miocene, has been discussed in the notes to accompany the new Geological Map. The coastline from the mouth of the Pieman to Trial Harbour, and continuing thence to Kelly's Basin, is a line of strong down faulting to the south, and it would seem that this has had a good deal to do with the truncation of the mineralised rocks. Parallel to this, but a few miles to the north-east, there is evidence of another similar fault, which was first suggested to me by Dr. Loftus Hills. This would account for the 3000 feet difference of elevation between the Permian capping Mt. Dundas and that at Mallana. Such a fault would also have a marked effect probably on the south-western boundary of the Zeehan field.

Miscellaneous Groups.

Quite independent of all the foregoing are the clusters of osmiridium, nickel, and asbestos prospects which are in all cases directly derived from ultrabasic intrusive rocks. To this category also belong the chrome-bearing magnetite iron ores at Beaconsfield, which are magmatic segregations in the serpentine, and also perhaps the magnetite deposits at Zeehan, Long Plains, Hampshire, and Highclere.

Isolated groups of alluvial gold accumulations occur about the Jane River and again about the Mainwaring River. In neither case has the source of the gold been found, and in both cases a systematic search is warranted. In the case of the Mainwaring the source is likely to be an enriched gossan capping primary sulphides. The Jane River field is, however, in a very different environment, and the source may prove to be of sedimentary type in the Pre-Cambrian rocks.

The Cox's Bight tinfield is grouped round a small intrusion of unstressed granite in Pre-Cambrian rocks. Since the granite is very limited the tin-bearing area is not likely to extend far. Wolfram is also present.

An important tin tungsten province occurs on King Island. The principal known deposit is the King Island Scheelite body, which is a contact reaction deposit at the junction of granite and limestone. But, in addition, good prospects for wolfram and cassiterite quartz reefs exist along the old Sea Elephant Prospecting Association leases in the centre of the island, and alluvial tin occurs on leases originally held by the same association; cassiterite, monazite, rutile, and zircon are constant constituents of the Frazer River beach ilmenite sands. There is doubtless considerable promise in this region, but the principal obstacle is the thick mantle of soil and superficial deposits which cover so much of the island.

The small group of gold prospects about Cygnet is unique in that this is the only known occurrence of Post-Triassic metallogenesis in Tasmania. The gold has been introduced by alkaline nepheline syenite porphyries of late Mesozoic or early Tertiary age.

Conclusion.

I append individual reports by Messrs. Henderson and Keid and a list of references to earlier papers quoted in this report.

Finally, I wish to express my thanks for the loyal co-operation of the officers of the Geological Survey during the year.

Field Geologist Q. J. Henderson reports:—

The following is a summary of the field investigations undertaken by me during the year ended December, 1945.

Two field investigations were undertaken jointly with the Government Geologist, Dr. S. Warren Carey, namely:—

The Mount Cleveland Tin Mine,
The Bellerive-Risdon Ground Water supply,

and a summary of the results obtained are contained in the Government Geologist's annual report.

The Mt. Farrell District.

The systematic geological survey of the Farrell district was continued during the first three months of the year, but progress was seriously retarded owing to an abnormally wet season. Most of the time was occupied in extending the main control survey to the north and east of Mount Farrell. The traverse of the West Coast Conglomerate was completed for the whole of Mount Farrell, including Little Farrell.

The White Hawk line of mineralization was examined in part only, and the provision of adequate track facilities is necessary before the work can be completed satisfactorily.

Diatomaceous Earth.

The deposits of diatomaceous earth at Andover were visited for the purpose of obtaining samples, and as the quality was unattractive for the required purpose, no further development occurred.

Alleged Ammonia Deposits—Trial Harbour.

At Trial Harbour, geological conditions are distinctly unfavourable for the formation of the extremely rare ammonium minerals and climatic conditions are such that there would be no accumulations of the highly soluble ammonium salts. The barren conditions of the area in respect to vegetation give no reason to suspect the presence of any mineral deposit with the properties of a fertilizer.

Butler's Gorge—Dam Foundations.

The Butler's Gorge Dam site was visited for the purpose of continuing the detailed geological examination of the dam site excavations. The study of the fracture pattern revealed the existence of three primary systems of fractures, which, through a lack of observable flow structures, could not be correctly orientated. Regarding the fault which traverses block A, the evidence of striae and slickensides indicates that the general movement has been horizontal in the direction of the fault. Although this fault has been long inactive, there is no evidence of its stability and the possibility of renewed movement along the fault cannot be overlooked entirely.

The study has shown that there are no clay seams of sufficient magnitude to affect seriously the stability of the dam foundations. As the three directions of maximum weakness are south 87 degrees west at an elevation of 45 degrees, south 20 degrees, west at an elevation of 19 degrees, and south 8 degrees west at an elevation of 22 degrees it is apparent that the direction of the major thrusts of the dam are most advantageously placed.

"Rhodochrosite."

An examination of the Read-Rosebery ore bodies was undertaken to determine the possibility of obtaining supplies of rhodochrosite to meet a London demand for this mineral. The examination established that the mineral recorded as rhodochrosite was in fact only a manganiferous carbonate. Although fairly abundant in the ore hand picking would be necessary and this is possible only when the market value of the product is sufficiently high. As rhodochrosite was not present in sufficient quantity in the ore no further action was taken.

The remainder of the year was spent on survey computations in connection with the Farrell control survey, the preparation of plans and report on the Farrell Mine, together with the proposed programme of exploratory drilling and general routine matters.

Field Geologist H. G. W. Keid reports:—

During the year a total period of 35 weeks was spent in the field, 14 weeks of which were spent in camping.

With the exception of a period of six weeks spent in an examination of the area in the vicinity of Cradle Mountain, all the field work has been done in the district between the east coast of the State and a line joining Boobyalla, Gladstone, Gould's Country, and St. Helens.

Although a general examination of the area was made the principal object was the stimulation of the tin-mining industry in the north-eastern part of the State with particular attention to search for areas of alluvial ground considered suitable for testing by boring.

A report has been submitted in which attention has been drawn to the nature of the known deposits and emphasising the necessity for closely spaced bores in testing any new areas. Maps have been prepared and attention drawn to potential tin-bearing areas. The mining of lode or vein tin ore has never had continued success in the district and operations have been spasmodic. Suggestions have been made relative to searching for new veins.

There is no gold mining in the district and prospects are not bright for its resuscitation. As suggestions have been made relative to the re-opening of the old Portland Mine, special attention has been drawn to Geological Survey Bulletin No. 25, in which is recorded the narrowness of vein and low grade of ore when the mine last closed down.

In the Cradle Mountain district the work was hampered by bad weather. An exceptionally wet summer resulted in snow and sleet over the greater portion of the period spent there. A general examination of the district was made and a map was prepared to record the geological and principal topographic features.

The period in office was devoted to the writing of reports and compilation of explanatory maps.

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APPENDIX II.

REPORT OF THE CHIEF CHEMIST AND METALLURGIST.

ANNUAL REPORT, 1945.

I beg to submit my annual report for the year ending December, 1945:—

Determinations and Analyses.

Determinations were made of gold, silver, tin, lead, aluminium, arsenic, antimony, cerium, beryllium, barium, bismuth, boron, calcium, chlorine, chromium, osmiridium, phosphorus, thorium, tungsten, titanium, zinc, and zirconium.

Analyses were made of ores, minerals, clays, rocks, coal, shale, bauxite, water, &c.

A considerable number of bauxite samples were analysed for the Department and the Mineral Resources Survey and this work also entailed research investigations into methods of analyses.

The number of determinations approximated 5000.

Ore Dressing Investigations.

Mt. Bischoff Tin Mine.

Investigations were continued during the year and were confined to problems associated with the treatment of the Greisen ore-body. Previous test work with this ore was performed on samples obtained from underground mine workings and three samples were submitted for gravity concentration tests on similar line to that previously reported. (Investigation No. 205/44.)

Investigations Nos. 402-406, *and* 407-45.

References.—Preliminary report, 10.9.45.

Ore Dressing Investigations reported during 1944 concluding with Investigation No. 205/44, Appendix 2, dated 23.10.44.

Total Investigations—summary, July, 1944.

Departmental report, 22.8.45.

Preliminary.—Investigation 205/44, Appendix 2, resulted in optimum recoveries of 72·8 to 74·9 per cent, as shown in tests 22 and 21 respectively. Treatment consisted of stage ball mill grinding and wet screening to minus 85 mesh B.S. screens followed by cleaner flotation rejection of sulphides in pulp of high alkalinity with lime. Flotation tailings were classified and tabled to finished concentrates. Tests were conducted with variable quantities of lime and without lime and it was conclusively shown that addition of lime to a p.H. value of 11, or slightly in excess of this figure, resulted in exceptionally good flotation conditions *with minimum loss of cassiterite in the sulphide flotation concentrate.* Treatment previous to flotation with lime such as tabling to pyritic concentrates, flotation of sulphides at natural p.H. values and tabling to finished concentrate resulted in a recovery of 62 per cent, or approximately 10 per cent lower than with the lime. (Details of this test are shown in test 8 (205/44 of the 22.8.44.) The higher recovery with lime treatment is mainly occasioned by the difference in loss of cassiterite in the sulphide flotation concentrates. Five per cent of the tin was lost in this product in test 21 and 15 per cent in test 8. Mineragraphic investigations by Dr. Stillwell on sulphide flotation concentrates produced without lime and super-panner products from same showed that the high cassiterite loss was caused by cassiterite-talc composites and cassiterite coated with talc. The reason for this being that talc and likewise the composites, &c., floated readily. The lime circuit partially depresses talc and also it is presumed that some cassiterite is freed of its association with talc. Much of the casserite floated with sulphides at natural p.H. values is of particle sizes which are effectively recoverable by gravity concentration.

Object of Investigation.—Previous test work has been conducted (Investigations 205/44) on a sample of ore stated to be obtained from underground workings and considered to be representative of same. Proposals of future operations include treatment of this type of ore together with surface ore and a hard ore body east of the underground working and exposed in the Pig Flat area. In this investigation results are given of test work on the three ore types and the object of the investigation is to obtain information relating to effective recovery and the suitability of the three types for treatment by flotation in alkaline pulps for flotation rejection of sulphides, &c., and table concentration in similar detail to test No. 205/21/44.

Flotation tests were also undertaken with No. 407 to check research reported in investigation 205/44 and to obtain additional data for a mill test of "Greisen" ore at Renison Associated Company's mill at Renison Bell early in October. Details of this work are shown in Tables 11 to 14 and concern effects of variable p.H. values with lime and comparison of rougher and cleaner flotation and pine oil and eucalyptus.

Samples.—Three samples were supplied by Mr. L. G. Wilkins, H.Q. Metallurgist, Department of Supply and Shipping, Waratah, as follow:—

No. 402.—"(2) Grab sample of the eastern extension of the Greisen ore body situated in the Pig Flat area."

No. 406.—"(1) Grab sample of all decomposed material immediately above the main Greisen ore body."

No. 407.—"(3) Grab sample of broken ore in the stopes of the Greisen ore body, Main Tunnel."

Tin Contents.—The samples were assayed at Waratah and by the Mines Department with the following results. (Mines Department results in brackets):—

Table 1.

	Per cent.		Tin.
	Total.		Vanning.
402	1·0	(1·1)	0·4
406	1·2	(1·1)	0·96
407	0·67	(0·56)	0·7

Table 2.—Additional Assays.

	402	406	407
S per cent. total	17·9	17·3	18·7
SO3 per cent	1·3	1·4	0·14
Cu per cent	0·09	0·06	0·03
As per cent	0·9	0·06	0·1
Acid Insoluble	34·5	45·5	26 4
Fe	20·8	...	31·2

Summary.—The three samples were treated in the following manner:—

Stage ball mill reduction and wet screening to minus 85 mesh B.S. screen. Cleaner flotation to reject sulphides with the following re-agents and conditions:—

TABLE 3.

	Rougher.	Cleaner.
	lbs. ton/mins.	lbs. ton/mins.
Copper Sulphate	1/5	0·25/5
Limil	to pH of (approx.)	11
Mixed Xanthates	1·25/5	0·5/5
Pine Oil	0·1	0·05
Flotation Time	/5-7	/5-7
Per cent. Solids	25	approx. 10–15

Limil consumptions were variable and amounted to 5·3, 17·3, and 30 lbs. per ton, in tests 407, 406, 402 respectively. The test procedure includes decantation of liquor to waste from grinding and screening operations and if this liquor had been included in the tests the limil consumptions in the same order would have been 6·6, 27·3, and 42 lbs. per ton.

Flotation tailings were classified at 20m. m/second and products concentrated by tabling to concentrates 20 to 38 per cent tin.

Test Results.

TABLE 4.

	Investigation.		
	402	406	407
Recovery, per cent	30·48	74·75	77·38
Effective Recovery per cent. Tin	0·34	0·86	0·43
Per cent. Tin in Concentrate	22·84	38·34	20·93
Per cent. Sulphur in Concentrate	25·2	21·2	21·7
Per cent. Tin in Ore (composite)	1·13	1·16	0·55
Per cent. Sulphur Ore (compos.)	17·4	16·8	17·6
Cleaner Flotation Concentrate			
Per cent. Weight	25·79	35·18	51·54
Per cent. Tin	0·4	0·11	0·08
Per cent. Tin Distribution	9·12	3·15	7·47
Per cent. Sulphur	42·4	29·0	30·0
Per cent. S. Distribution	62·9	57·3	87·6

Flotation rejection of sulphides in 402 and 406 was low, but the treatment resulted in similar grades of concentrate to 407.

Recovery in 402 was very low (30·48), and the major loss was found to be in the slime tailing (C/O Tailing 46·41 per cent tin distribution). Sizing analysis of a composite table middling, plus tailing, shows that the tin loss is distributed throughout all sizes. Two sizings have been examined with the following results:—

—120+150 *mesh* (125—105—microns). Gangue minerals were decomposed and residual cassiterite concentrated by vanning, weighed and examined for particle size. The quantity of cassiterite recovered amounted to 45 per cent of the tin in the fractions, and particle sizes ranged from 10 to 75 microns and the approximate average size was 45 microns. The examination shows that the loss of cassiterite in this fraction was caused by composite particles.

Infra-sizer Fraction 1. (Nominal size for cassiterite 76 to 40 microns).—This fraction was treated in a similar manner to the —120+150 mesh fraction and only 5 per cent of the tin in the fraction was recovered. Particle size ranged from 15 to 75 microns and the approximate average 45 to 60 microns. It is thus indicated that some of the recovered cassiterite existed as free grains, but the majority existed as sizes too small to be effectively recovered by gravity concentration. Copper content of 0·9 per cent precludes the possibility that Stannite contributes to the low recovery. The examination shows that the low recovery is occasioned by small particle sizes both as free and composite grains. The tin lost in table middling plus table tailing amounts to 60·38 per cent overall, of which 15·76 per cent is in the plus 200 mesh fractions.

The tin lost in table tailings and middlings in the tests 402, 406, and 407 amounted to 60·38, 22·1, and 15·15 per cent respectively.

Tests reported in Tables 11 to 14 confirm that p.H. values in excess of 11 result in minimum loss of cassiterite in the froth and reduces the quantity of talc floated, also cleaner flotation further reduces the loss of cassiterite. Pine oil and eucalpyts phellandrine are both suitable as frothers. Excess of frother occasions increase in loss of cassiterite.

Details of Test Results.

TABLE 5.

402—

Product.	Per Cent.		Per Cent. Tin Distribution.
	Weight.	Tin.	
Concentrate, Spigot	0·53	17·97	8·41
Concentrate, C/overflow	0·98	25·48	22·07
Middling, Spigot	1·38	1·78	2·17
Middling, C/overflow	2·25	2·02	4·01
Tailing, Spigot	9·40	0·94	7·81
Tailing, C/overflow	59·67	0·88	46·41
Cleaner Flotation Concentrate	25·79	0·40	9·12
Composite Head	100·00	1·13	100·00
Composite Concentrate	1·51	22·84	30·48
Ratio of Concentration 66			

406—

Product.	Per Cent.		Per Cent. Tin Distribution.
	Weight.	Tin.	
Concentrate Spigot	1·11	40·78	39·03
Concentrate C/overflow	1·15	36·01	35·72
Middling, Spigot	2·71	1·21	2·83
Middling, C/overflow	3·00	1·40	3·62
Tailing, Spigot	10·46	0·44	3·96
Tailing, C/overflow	48·39	0·28	11·69
Cleaner Flotation Concentrate	33·18	0·11	3·15
Composite Head	100·00	1·16	100·00
Composite Concentrates	2·26	38·34	74·75
Ratio of Concentration 44			

407—

Concentrate, Spigot	1·11	18·08	36·37
Concentrate, C/overflow	0·93	24·33	41·01
Middling, Spigot	1·83	0·28	0·92
Middling, C/overflow	1·97	0·58	2·07
Tailing Spigot	3·95	0·23	1·65
Tailing, C/overflow	38·67	0·15	10·51
Cleaner Flotation Concentrate	51·54	0·08	7·47
Composite Head	100·00	0·55	100·00
Composite Concentrate	2·04	20·93	77·38
Ratio of Concentration 49			

TABLE 6.

Table Middling Plus Table Tailing Composites.

Sizing analyses and tin distributions: Sizings to 200 mesh by B.S. Screens and minus 200 mesh fractions by Haultain Infrasizer.

Mesh Size.	402 Per Cent.			406 Per Cent.			407 Per Cent.			Overall Per Cent. Tin Distribution Cum.		
	Weight.	Tin.	Tin Distribution.	Weight.	Tin.	Tin Distribution.	Weight.	Tin.	Tin Distribution.	402	406	407
+100	4·89	0·95	4·92	10·11	0·66	16·39	2·32	0·24	2·61	2·97	3·62	0·39
+120	7·09	0·93	6·97	7·50	0·57	10·50	6·88	0·22	7·11	7·18	5·94	1·47
+150	9·78	0.88	9·11	11·12	0·48	13·12	10·02	0·21	9·88	12·68	8·84	2·97
+170	1·01	0·97	1·04	0·62	0·46	0·70	1·16	0·20	1·09	13·31	9·00	3·14
+200	4·26	0·90	4·05	5·20	0·49	6·26	9·35	0·17	7·47	15·76	10·38	4·26
I. S.1	13·90	0·92	13.53	12·98	0·43	13·72	6·60	0·26	8·05	23·93	13·41	5·49
I. S.2	6·65	0·68	4·77	6·59	0·26	4·20	7·65	0·13	4·67	26·81	14·34	6·19
I. S.3	6·71	0·86	6·11	5·30	0·32	4·17	7·14	0·23	7·71	30·48	15·27	7·36
I. S.4	5·79	1·48	9·06	5·97	0·68	9·98	6·75	0·42	13·31	35·95	17·47	9·38
I. S.5	5·36	1·92	10·89	4·52	0·73	8·11	7·24	0·38	12·92	42·53	19·26	11·33
I. S.6	4·69	1·75	8·69	4·12	0·45	4·55	7·51	0·24	8·46	47·78	20·27	12·62
I. S.7	29·87	0·66	20·86	25·97	0·13	8·29	27·38	0·13	16·72	60·38	22·1	15·15
Composite	100·00	0·94	100·00	100·00	0·40	100·00	100·00	0·21	100·00			

TABLE 7.

Middling Plus Tailing Composite.

Test 205/21 (published 23.10.44 for comparative purposes with tests reported herein).

Mesh Size.	Per cent. Weight.	Tin.	Tin Distribution	Overall per cent. Tin Distribution (Cum.)
+ 100	3·98	0·54	4·98	0·94
+ 120	8·04	0·49	9·12	2·65
+ 150	8·37	0·45	8·72	4·29
+ 170	0·52	0·52	0·63	4·41
+ 200	3·48	0·51	4·11	5·18
I. S. 1	9·73	0·54	12·17	7·47
" " 2	9·50	0·34	7.48	8·88
" " 3	10·59	0·68	16·67	12·02
" " 4	6·87	0·93	14·79	14·80
" " 5	5·81	0·62	8·34	16·36
" " 6	6·10	0·30	4·24	17·17
" " 7	27·01	0·14	8·75	18·81
Composite...	100·00	0·43	100·00	...

TABLE 8.

Test 407.

Product.	Sulphur Distribution. Per cent. Weight.	Per cent. Sulphur.	Per cent. Sulphur Distribution.
Cleaner Flotation Concentrate	51·54	30·0	87·60
Concentrate Spigot	1·11	25·9	1·64
C/overflow	0·93	16·6	0·85
Middling, Spigot	1·83	32·1	3·33
C/overflow	1·97	7·8	0·87
Tailing, Spigot	3·95	14·8	3·31
C/overflow	38·67	1·1	2·40
Composite	100·00	17·6	100·00

TABLE 9.

Partial Analyses of Table Concentrates.

	406	407
Iron	22·0	36·6
Sulphur	21·3	21·9
Tin Oxide	48·7	26·6
Acid Insoluble	3·7	4·2
Lime	0·12	0·4
Magnesia	0·50	2·44

Tests indicate that practically all of the iron in test 407 is present as pyrrhotite and in test 406 only 10·6 per cent is present as pyrrhotite.

Non-Sulphide Gangue Minerals.

A previous investigation (205) showed that the non-sulphide gangue minerals consisted mainly of talc with some carbonates.

Samples 402 and 407 both contain dolomite, but the proportion of talc is much higher in 407 than 402 as shown by the following analysis:—

Tin oxide has been excluded.

TABLE 10.

Analyses of Acid Insoluble (Magnesium Calculated to Talc).

	402	407
Talc	19·6	84·3
SiO_2	54·9	8·5
Al_2O_3	18·3	1·57
Fe_2O_3	2·1	1·77

TABLE 11.

Rougher Flotation Tests with Sample 407. Lime used—hydrated lime marketed under the trade name of Limil.

Object of tests—effects of variable Lime.

Constant treatment conditions. Stage ball mill ground to minus 72 mesh by wet screening.

Reagents lbs. per ton/minutes conditioning; in sequence: $CuSO_4$ 1/5, Limil variable 0/20, Mixed Xanthates 1·25/5, Pine Oil 0·1. Flotation time 4 minutes.

Test.	Limil lbs. ton.	PH Value before and after test.	Rougher Flotation Concentrate. Per Cent.				
			Weight	Tin	Tin Distribution	Sulphur	Sulphur Dist.
B	Nil	... ... 6·6	72·5	0·3	39·1	24·0	93
C	2	9·65 ... 9·3	60·7	0·19	21·8	23·5	77
E	4	11·0 ... 10·5	65·9	0·19	22·7	25·7	91
F	6	11·6 ... 11·3	63·0	0·12	13·3	26·5	94

TABLE 12.

No. 407—

Table showing approximate percentages of talc floated under various conditions. Talc is assumed as acid insoluble. Constant conditions, similar to table No. 11 with exceptions shown under "Conditions." Rougher flotation and 0·1 lb. pine unless otherwise stated.

Test.	Conditions.	Percentage talc floated
B	Limil, Nil pH 6·6	87·9
C	Limil, 2lbs pH 9·65/9·3	77·7
E	Limil, 4lbs pH 11·0/10·5	70·1
F	Limil. 6lbs pH 11·6/11·3	56·1
G (a)	Limil, 6lbs pH 11·6/11·3 frother 0.1 lb. Eucalyptus phellandrine.	51·1
I.	Similar to test F but in addition cleaner flotation at same pH	44.7

TABLE 13.

No. 407—

Comparison of Rougher and Cleaner Flotation.

Test F.—Rougher flotation. Test I.—Cleaner flotation.

	Test.	
	F	I
Flotation Concentrate, per cent Weight	63·0	58·1
Flotation Concentrate, per cent Tin	0·12	0·08
Flotation Concentrate, per cent. Tin Distribution	13·3	8·4

Sulphur distribution was in excess of 90 per cent in both tests.

TABLE 14.

Comparison of Pine Oil and Eucalyptus Phellandrine as Frothers.—Similar rougher flotation conditions to those shown in Table No. 11.

Test F.—Pine Oil. Test G.—Eucalyptus Oil.

Quantity of frother used in each test 0·1 lb. per ton.

	Test.	
	F	G
Flotation Concentrate—		
Tin Distribution, per cent	13·3	11·3
Sulphur Distribution, per cent.	94	91

After completion of flotation in test G. and additional 0·1 lb. per ton of eucalyptus was added and flotation concentrate was removed for two minutes. This float resulted in an additional 8·7 per cent of concentrate, and the tin and sulphur distribution for the two concentrates then amounted to 19·7 and 97 per cent respectively. This test demonstrates the necessity for control of frother as excess frother results in rapid flotation of talc, and this condition results in an increase in mechanical loss of cassiterite in the froth; the increase in the test amounted to 8·4 per cent.

Investigation No. 402-7/45.—

Greisen Ore, &c.

Object to Investigation.—Previous research for the rejection of sulphides by flotation has shown that rougher and cleaner flotation at a p.H. in excess of 11 with lime results in minimum loss of cassiterite in the sulphide froth and good sulphur rejection.

Test work on three ore types (402, 406, and 407) showed high lime consumptions with surface ore from the Greisen ore-body and hard ore from Pig Flat, and this investigation deals with the results of rougher flotation at natural p.H. values followed by cleaner flotation at p.H. values in excess of 11 to obtain information relating to possible reduction in lime consumption and effect on loss on cassiterite in comparison with procedure in which both rougher and cleaner flotation was conducted in pulps at p.H. values in excess of 11 with lime.

Sample.—The sample of ore used in the investigation was a composite of equal parts of Nos. 402, 406, and 407. (Refer to report dated 24.9.45), and it was found that the sample showed signs of oxidation during the four months of storage in the laboratory. Consequently, it is considered that a fresh sample is necessary to place reliance on the results obtained particularly as regards sulphide rejection and the cassiterite content of same. A summary of the results obtained is shown below, but it is considered that further work should be undertaken on fresh samples.

Summary.

1. Rougher flotation required 30 lbs. per short ton of limil for a p.H. in excess of 11. This figure is eight lbs. in excess of test work reported in September last.

2. Rougher flotation at a natural p.H. of 5·1 followed by cleaner flotation at a p.H. of 11·4 resulted in a limil consumption of 12 lbs. per short ton or a reduction of 60 per cent.

3. Rougher flotation at natural p.H. value resulted in a froth amounting to 57 per cent by weight and containing 18 per cent of the total tin in a product assaying 0·29 per cent tin. Cleaner flotation with limil at a p.H. of 11·4 reduced the weight of froth to 37 per cent and with an assay value of 0·14 reduced the tin in the froth from 18 to 5 per cent.

4. Rougher flotation at a natural p.H. followed by cleaner flotation with limil at p.H. of 11·4 to eliminate sulphides followed by table concentration resulted in a recovery of 64·5 per cent in a concentrate containing 12 per cent of tin. This recovery is similar to the average recovery previously obtained with samples 402, 406, and 407.

Mill Test of Greisen Ore at Renison Bell.

Resulting from consideration of possible future operations at Waratah for the treatment of Greisen ore, it was decided to transport 300 tons of ore from underground workings to Renison Bell for treatment at the Renison Associated Company's mill. This test was required to check on laboratory test work and to obtain data for future milling operations.

The ore was treated during October under the supervision of our staff, and much information of value was obtained. The grade of ore was below that estimated from preliminary samplings of the shipment at Waratah.

Milling operations resulted in a recovery of 48 per cent and analysis of this result showed that the loss of cassiterite was greater than anticipated in the sulphide tailing and was undoubtedly due to periodic "sanding up" of the flotation unit with consequent loss of cassiterite. Further, although cleaner flotation was desired it was only possible to operate the installed machine as a rougher unit. Examinations and tests with the sulphide and gravity tailings indicated that recovery could be increased to slightly in excess of 60 per cent. Test treatment of an ore sample ground and classified in the Renison Bell mill confirmed this figure.

Sizing analysis of the ground ore showed 32 per cent by weight and 15 per cent of the tin plus 200 mesh size and approximately 20 per cent of the tin was reported in infra-sizer fractions 4 and finer (minus 20 microns).

Ninety per cent of the sale concentrate reported in infra-sizer fractions 1 to 3 or 76 to 20 microns.

The mill test showed the necessity for efficient sizing to avoid "sliming" of the cassiterite and it has been indicated that vibrating screens would be satisfactory for this purpose.

The small grain sizes of the recovered cassiterite show that adequate attention must be given to efficient gravity concentration with particular attention to recovery of "slime" cassiterite.

Mill treatment resulted primarily in the production of a concentrate containing 10 per cent of tin and this was further treated by batch flotation for removal of sulphides and kieving for production of sale concentrate. The "slime" primary concentrate was not readily amenable to flotation without undue loss of cassiterite in the froth and accordingly flotation had to be conducted at an extremely slow rate to attain best results. This feature makes it desirable to obtain good flotation prior to gravity concentration. Products from treatment of the primary mill concentrate by batch flotation and kieving were weighted and sampled and the results showed a recovery of 94 per cent.

Summary of Other Investigations.

Silica, Sand, and Quartzite—Ulverstone.

(Investigation No. 37-42/45.)

Tests for removal of iron by acid digestion showed insufficient beneficiation with the quartzite samples for a specification of a maximum of 0·02 per cent of Fe_2O_3. The impurity is haematite and tests show that it is intimately associated with the quartzite. The sample of sand contained 0·02 per cent Fe_2O_3, and this was reduced to 0·01 per cent by digestion with hydrochloric acid. The sand was minus 200 mesh size.

Mt. Cleveland Tin Mine.

(Investigations 76-81/45.)

(Previous Investigations Nos. 63/44 and 94/44 and C.S.I.R. Mineragraphic Investigations 305 and 309.)

The sample used for this investigation was a composite of equal weights of six samples obtained by the Government Geologist, and stated to be from underground workings 50 feet below Halls Cut. The assays of these samples were as follow:—

No.	Description.	Tin Per cent.			
		Total.	Vanning Assay.		Sulphur Per cent.
			Per cent. Tin	Per cent. Recovery.	
1	2	0·97	0·84	86·6	13·5
2	—	1·53	1·29	84·3	11·4
3	66 ft. from X-cut.....	0·70	0·53	75·7	11·4
4	46 ft. from X-cut.....	1·06	0·82	77·5	10·2
5	26 ft. from X-cut.....	0·66	0·54	81·8	18·4
6	6 ft. from X-cut.....	0·93	0·79	84·9	12·4

The composite sample was assayed with the following results:—

	Per Cent.
Tin	1·0
Copper	0·39
Sulphur	12·9
Acid Insoluble	39·8
Pb., Sb., Bi., As.	Nil

Table concentration tests to pyritic concentrates containing 20 per cent tin resulted in recoveries of 63 and 78 per cent, respectively, with (1) grinding to 36 mesh and (2) grinding to 36 mesh, grinding tailing and middling to 150 mesh and retabling. Treatment of the concentrate (2) by roasting and concentration to a finished concentrate resulted in an overall recovery of 65 per cent.

Closed circuit grind in a ball mill to 85 mesh followed by flotation rejection of sulphides and table concentration of the sink product resulted in a recovery in a finished concentrate of 57 per cent.

The investigation showed the advantage of two stage reduction and concentration and shows higher recovery by removal of sulphides by roasting as compared with flotation. However, the comparison does not take into account factors existing with mill calcination such as losses in flue gases.

Loss of cassiterite in sulphide flotation has been shown previously to be mainly occasioned by composite particles of cassiterite and stannite and cassiterite rimmed with stannite.

Beach Sands—Fraser River-King Island.

(Investigation No. 108-9/45.)

Samples of beach sands containing ilmenite, rutile, zircon, &c., were submitted for gravity concentration, and magnetic separation of the concentrates to determine the quality of products obtainable by this means. Magnetic separation was performed with a "Rapid" laboratory model magnetic separator. Magnetic separation shows some separation of impurities such as chromium. Non-magnetics consisted mainly of rutile and zircon.

Typical products of magnetic separation are shown in the following tabulation:—

No. 109—4 (+100 mesh fractions.)

	Per cent.			
	Weight.	TiO_2	Cr_2O_3	Insoluble.
Magnetic Product 1	0·22	...	...	...
,, ,, 2	3·36	...	...	...
,, ,, 3	37·59	32·0	0·7	31·08
,, ,, 4	22·42	50·0	3·0	6·50
,, ,, 4a	8·07	34·0	1·8	24·60
Non-Magnetic 5	28·34	53·0	0·1	38·14

PYRAMID TIN ORE.

Concentration by Tabling and Flotation.

(Investigation No. 152/45.)

The ore consists essentially of quartzite and slate and the tin is present as cassiterite. Sulphides were not present. The sample tested in this investigation consisted of a composite of two samples, obtained by the Extension Officer, mixed in proportions to give an ore containing a relatively low tin content (0·64 per cent tin).

A supply of this sample was forwarded to C.S.I.R., Melbourne, who desired to undertake research work on an ore of this type. The research method used by C.S.I.R. being concentration by flotation using sodium cetyl sulphate as a collector for cassiterite, and the method has been patented by them (Aust. Patent No. 12506/43). For comparative purposes, test work was undertaken in the laboratory by gravity concentration and flotation in accordance with specifications set out in the patent referred to.

Concentration by tabling resulted in recoveries of 78 and 80 per cent at reductions of —36 and —85 mesh screens. Table tailings contained approximately 0·1 per cent tin.

A commercial grade of sodium cetyl sulphate " Cetynol " was used in the flotation tests and with additions of the collector up to 3 lbs. per ton, resulted in recoveries of 73 to 86 per cent. Higher quantities of collector decreased the grade of rougher concentrates which ranged from 5 to 11 per cent of tin. The general conditions for flotation set out in the patent and tested were:—Ball mill grinding in alkaline pulp with soda ash (p.H. 10-11), to suitable reduction, which in this case, was approximately —100 mesh size.; desliming of ground ore to remove material equivalent to minus 29 micron quartz; deslimed ore then treated in flotation cell with hydrochloric acid to produce a p.H. value of 2 to 3 and heated to 35 degrees centigrade and cetynol and frother added and concentrate produced. Loss of cassiterite in the slime amounted to 10 per cent. A flotation test using 0·48 lbs. per ton of oleic acid in a pulp having a p.H. value of 6·9, 1 lb. sodium silicate, and 0·15 lb. of frother B23, and at a temperature of 32 degrees centigrade, resulted in a recovery of 93 per cent in a concentrate containing 5·8 per cent of tin.

Hellyer Clay—Flotation.

(Investigation No. 188/45.)

A sample of clay was received from the Associated Pulp and Paper Mills, Burnie, for investigation of beneficiation by hydraulic separation and froth flotation. Collector used for flotation of Kaolin was purified lauryl amine hydrochloride and test procedure was: either preliminary treatment for removal of finest particles or flotation direct. Adjustment of p.H. value of deslimed feed to 3, addition of sodium lignin sulphonate (re-agent 653), followed by small additions of the collector, conditioning for 30 seconds, and flotation for 90 seconds, and repeat treatments until the required amount of collector had been added. Test work followed reported results by Prof. H. H. Kellogg, and although some samples of Kaolin reacted to his procedure, the Hellyer clay required the addition of a frother. The process claimed separation of Kaolin and quartz and showed fair success with the sample tested. However, the resultant floats were not high grade Kaolin and it was found that the major contaminant was a feldspar generally present as particles smaller than 10 microns.

Talc—Gawler.

(Investigation No. 325-6/45.)

Two samples of talc classified as 2nd and 3rd grade under existing marketing conditions were submitted by Mr. A. Pearson for tests by acid digestion to reduce colour. Colour was found to be occasioned by iron minerals, and preliminary tests showed that dilute hydrochloric acid effectively reduced the yellowish colour. The talc samples were of high quality with the disability of colour only. Practically complete colour removal resulted from digestion with 35 per cent acid, and the iron extracted thereby amounted to 0·016 and 0·05 per cent for the 2nd and 3rd grade respectively.

Colour measurement was made with a Lovibond Tintometer, and comparison made with a standard No. 1 sample which showed colours of 0·2 yellow and 0·1 red Lovibond units.

The 2nd grade sample had colour of 0·3 yellow and 0·3 red units, and after treatment with 10 per cent HCl at 50°C for 30 minutes showed units of 0·3 yellow and 0·1 red, which compared favourably with the standard No. 1 sample.

The 3rd grade sample had colour of 0·5 yellow and 0·4 red units, and after treatment with 10 per cent HCl for three hours at 50°C colour was reduced to 0·1 yellow and 0·1 red. Acid consumption amounted to 16 lbs. per ton of 35 per cent acid.

In conclusion, I desire to record my appreciation of the services rendered by the laboratory staff.

W. ST. C. MANSON, Chief Chemist and Metallurgist.

APPENDIX III.

REPORT OF THE CHIEF INSPECTOR OF MINES.

The Chief Inspector of Mines (Mr. W. H. Williams) reports:—

Mines and Works Regulation Act.

The average number of men employed in mining, quarrying, and metallurgical operations was 5178, as compared with 5439 for the previous year.

There was a shortage of suitable labour for planned developmental and productive operations at the principal mines and works.

Accidents.

The total number of accidents, registered under the provisions of Section 23 of the Act, was 46, as against 73 for the previous year. The 46 accidents resulted in injury to a like number of persons.

The appended tables relate to—

(1) Fatalities and non-fatal casualties at mines, quarries, and works, which involved absence from work for more than 14 days.

(2) The average number of persons employed and the rate per 1000 persons employed, of fatal and non-fatal injuries in the State and in each mineral division.

There were an additional four accidents in the eastern division, two less in the northern and southern division, one less in the north-western division, and a decrease of 21 accidents in the western division. There were no accidents of moment in the north-eastern division.

Two accidents were attended with fatal injuries to two persons, as compared with three accidents involving fatal injuries to four persons last year. Both fatalities occurred in the western division.

No fatality occurred in underground workings, the two accidents being associated with operations in opencut workings. Although the manner in which the fatal injuries were sustained differed, each accident was due to a fall of ground from the face of the workings.

In one case, blasting had left the summit of the face of an opencut in a doubtful condition and, in order to ensure saftey it was decided to bore and blast the doubtful section away. Preparation were being made for this work, when a mass of unstable ground, upon which two miners were proceeding with the planned work, fell away and carried them with it down the face of the workings. Safety-lines had been provided and, having been affixed to a safe anchorage, were hanging over the face, but were not attached to or held by the men. One miner succeeded in grasping a line and thereby escaped serious injury, but the other was unable to grasp a line and was carried with the fall of ground about 40 feet down the face. He sustained injuries to which he succumbed four hours later.

The circumstances attached to this accident and other instances of working on faces gave rise to the question of establishing a set of rules controlling the provision and use of safety-lines. The nature and preparation of rules suitable for common application is to receive attention.

The second fatality was the result of a small quantity of ground falling from the face of an opencut and striking a minor engaged in loading a main firing charge in a bulled toe-hole. Several down and toe holes had been bulled and had shaken the face. It was alleged that the face had been barred of all loose material prior to loading the main firing charges, but the evidence submitted at the inquest left some doubt in regard to the completeness of the examination of part of the face prior to the accident.

Of the 44 accidents causing non-fatal injuries to a like number of persons, 20 occurred underground and 24 were allied with surface operations at mines, quarries, and works. Five casualties were due to falls of ground in underground workings, seven persons were injured when handling appliances, six accidents were associated with trucking operations, one person fell down a ladderway, one person was injured when a staging collapsed, and 24 accidents were of a miscellaneous nature.

The rate per 1000 persons employed fatally injured was 0·386, as compared with 0·735 for the previous year.

The rate per 1000 persons employed incapacitated for more than 14 days was 8·497, as compared with 13·054 for the previous year.

The overall rate of accidents was the lowest recorded for many years and reflects creditably upon the control and management of hazardous operations.

Prosecutions.

Legal proceedings were instituted in several cases, where the commission of offences against the legislation was more serious than could be satisfied with cautionary measures.

Action was taken against four persons for failing to use appliances provided for the suppression of dust during rock-drilling operations. An underground miner was prosecuted for negligence in the handling of explosives.

Proceedings were instituted against a person for the commission of an assault in a change-house and action was taken against a practice of persons alighting from moving trucks on an inclined haulage.

Health and Sanitation.

Regular attention was directed to matters pertaining to health and sanitation, close surveillance being exercised in controls pertaining to the suppression of atmospheric dust.

Inspectorial.

The inspectorial staff was maintained at normal level and every care was directed to the health and safety of those employed in the industry. The appended reports cover the activities of all inspectors.

COMPARATIVE Table of Statistics of Accidents in and about the Mines of Tasmania from 1st July, 1892, to 31st December, 1945.

Period.	Number of Miners Employed.	Number of Accidents.	Number of Persons		Total Killed and Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
1 July, 1892, to 30 June 1894	3405	25	7	20	27	7·934	2·057	5·877
„ 1894 „ 1895	3789	26	4	24	28	7·390	1·058	6·332
„ 1895 „ 1896	4160	22	7	16	23	5·529	1·682	3·847
„ 1896 „ 1897	4303	36	7	31	38	8·831	1·627	7·204
„ 1897 „ 1898	5530	36	13	33	46	8·318	2·351	5·967
„ 1898 „ 1899	6180	35	9	34	43	6·957	1·456	5·501
„ 1899 „ 1900	6834	19	7	16	23	3·365	1·024	2·341
„ 1900 „ 1901	7017	29	8	23	31	4·417	1·140	3·278
„ 1901 „ 1902	6438	38	7	35	42	6·524	1·088	5·437
„ 1902 „ 1903	6484	44	6	43	49	7·557	0·925	6·632
„ 1903, to 31 Dec., 1903	5604	27	8	20	28	4·977	1·428	3·569
1 Jan., 1904 „ 1904	6192	73	9	65	74	11·951	1·454	10·497
„ 1905 „ 1905	6586	34	7	30	37	5·618	1·063	4·555
„ 1906 „ 1906	7004	65	4	61	65	9·280	0·571	8·709
„ 1907 „ 1907	7516	68	6	64	70	9·314	0·798	8·515
„ 1908 „ 1908	6464	60	6	58	64	9·900	0·928	8·972
„ 1909 „ 1909	6054	54	6	49	55	9·085	0·991	8·093
„ 1910 „ 1910	5770	63	8	57	65	11·265	1·386	9·878
„ 1911 „ 1911	5247	80	4	77	81	15·437	0·762	14·675
„ 1912 „ 1912	5566	60	53*	53	106	19·044	9·522	9·522
„ 1913 „ 1913	6106	64	6	60	66	10·809	0·982	9·826
„ 1914 „ 1914	4741	69	9	62	71	14·977	1·896	13·081
„ 1915 „ 1915	3908	71	6	67	73	18·679	1·535	17·144
„ 1916 „ 1916	3864	53	2	51	53	13·716	0·517	13·198
„ 1917 „ 1917	4050	50	2	48	50	12·345	0·493	11·852
„ 1918 „ 1918	4279	50	5	45	50	11·684	1·168	10·516
„ 1919 „ 1919	4413	58	1	57	58	13·143	0·226	12·917
„ 1920 „ 1920	5364	52	2	50	52	9·694	0·372	9·322
„ 1921 „ 1921	4011	40	3	37	40	9·972	0·748	9·224
„ 1922 „ 1922	3835	31	4	27	31	8·083	1·043	7·040
„ 1923 „ 1923	4785	64	2	63	65	13·584	0·417	13·166
„ 1924 „ 1924	5264	72	1	73	74	14·057	0·189	13·867
„ 1925 „ 1925	5110	62	2	61	63	12·328	0·391	11·937
„ 1926 „ 1926	5309	54	5	52	57	10·736	0·941	9·794
„ 1927 „ 1927	5044	70	5	65	70	13·877	0·991	12·886
„ 1928 „ 1928	5170	47	1	46	47	9·090	0·193	8·897
„ 1929 „ 1929	4986	59	17	55	72	14·440	3·409	11·031
„ 1930 „ 1930	4606	55	4	52	56	12·158	0·868	11·289
„ 1931 „ 1931	4391	38	8	35	43	9·792	1·821	7·970
„ 1932 „ 1932	4605	71	4	67	71	15·418	0·868	14·549
„ 1933 „ 1933	4510	77	7	71	78	17·295	1·552	15·742
„ 1934 „ 1934	4843	108	4	105	109	22·506	0·826	21·680
„ 1935 „ 1935	5409	142	1	141	142	26·252	0·184	26·067
„ 1936 „ 1936	5432	97	4	96	100	18·409	0·736	17·673
„ 1937 „ 1937	5876	107	5	103	108	18·379	0·850	17·529
„ 1938 „ 1938	5891	103	2	102	104	17·654	0·339	17·315
„ 1939 „ 1939	5928	87	2	87	89	15·013	0·337	14·676
„ 1940 „ 1940	6000	103	2	102	104	17·333	0·333	17·000
„ 1941 „ 1941	5856	85	5	85	90	15·368	0·853	14·515
„ 1942 „ 1942	5572	89	4	86	90	16·152	0·718	15·434
„ 1943 „ 1943	5535	73	6	67	73	13·188	1·084	12·104
„ 1944 „ 1944	5439	73	4	71	75	13·789	0·735	13·054
„ 1945 „ 1945	5178	46	2	44	46	8·883	0·386	8.497

* Mount Lyell disaster.

TABLE showing Rate per Thousand Killed and Injured in different Divisions for the Year 1945.

Division.	Average Number of Men Employed.	Number of Accidents.	Number of Persons		Total Number Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000	
			Killed.	Injured.			Killed.	Injured.
Northern and Southern	1943	7	...	7	7	3·602	...	3·602
North-Eastern	306	...	...	...	...	...	...	...
Eastern	490	12	...	12	12	24·489	...	24·489
North-Western	440	3	...	3	3	6·818	...	6·818
Western	1999	24	2	22	24	12·006	1·000	11·006
Total	5178	46	2	44	46	8·883	0·386	8·497

ANALYSIS of Statistics of Accidents for Western Division.

Division.	Number of Miners Employed.	Number of Accidents.	Number of Persons		Total Number Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000	
			Killed.	Injured.			Killed.	Injured.
Mount Lyell	1473	12	2	10	12	8·146	1·358	6·788
Zeehan, &c.	526	12	...	12	12	22·813	...	22·813
Total	1999	24	2	22	24	12·006	1·000	11·006

APPENDIX IV.

REPORT OF THE CHIEF INSPECTOR OF EXPLOSIVES.

The Chief Inspector of Explosives (Mr. W. H. Williams) reports:—

Explosives Act, 1916.

The imports of explosives were as follows:—

	lb.
Monobel	84,150
Gelignite	706,200
Gelatine Dynamite	64,550
Blasting powder	11,725
Sporting powder	1,280
Ligdyn	13,700
Ajax	45,000
	Number.
Detonators	420,000
	Feet.
Primacord	25,000

Customary attention was directed to ensuring that all compounds were in good chemical and physical condition at the date of importation, and that there was no deterioration to render the explosives inert at the time of use.

Compounds, generally, were in good condition when imported and were preserved in good condition by regulated conditions of storage. Miss-fires were of less frequency and when located were found to be due mainly to faulty equipment or erroneous use of exploders in the case of electric shot-firing. The use of primacord for the instantaneous detonation of multiple charges was established as efficient and reliable.

An innovation in the provision of explosive trucks for the conveyance of canisters of explosives into colliery workings was allowed and eliminated the laborious task of manual conveyance previously in operation. The trucks are specially constructed and partitioned and are under supervision during periods of transport. From the aspect of safety the new system presents less hazards than the old method of servicing explosives to coal miners.

No accident was recorded in connection with the use of explosives.

One case of negligence in the handling of explosives in the underground workings of a mine necessitated the institution of legal proceedings. Lesser irregularities were satisfied with cautionary measures.

Inflammable Liquids Act, 1929.

There were no major installations and pump storage continued to be restricted by petrol rationing. There was an absence of fires and accidents in connection with the storage and handling of inflammable liquids. Irregularities in practices were remedied without recourse to legal proceedings.

APPENDIX V.

REPORTS OF INSPECTORS OF MINES AND EXPLOSIVES.

Inspector K. A. Rae, Queenstown, reports:—

Employment.—The average number of persons employed in the mining industry was 1471, representing a decrease of 78 in the number employed last year. All these persons were employees of the Mount Lyell Mining and Railway Company Limited.

Accidents.—Twelve accidents, causing fatal injuries to 2 persons and non-fatal injuries to 10 persons, were registered under the provisions of the Mines and Works Regulation Act, as compared with 26 accidents, causing fatal injuries to 2 persons and non-fatal injuries to 26 persons, recorded for the previous year.

Eleven accidents, causing fatal injuries to 2 persons and non-fatal injuries to 9 persons, were allied with surface operations.

One accident, causing injury to one person, was associated with underground mining.

Eight accidents were due to lack of care by the injured person or his workmates. Four accidents were attributed to mis-adventure.

Of the accidents allied with surface operations, 2 fatal accidents occurred while mining was in progress at an open-cut working. The persons killed were members of a party of 11 miners, engaged in contract mining at a bench, 76 feet in vertical height.

In the first instance, one man was killed and his mate was slightly injured, when the top section of a bench face, on which the both men were working, fell away and carried them with it. The accident occurred about 1½ hours after the lower part of the face had been blasted. The effect of the blasting left the top section of the face overhanging. The ganger-in-charge and the two miners, examined the ground from the summit of the face and decided that, in order to make the place safe so that work could be continued below, it was necessary to bore a hole and shoot the top section down. Preparations were in progress for this work when the mass of ground fell without warning.

The miner who lost his life was classed as a 'leading hand' and considered one of the most experienced in open-cut mining. Although he had made provision for the use of a life-line for himself and his mate, he did not attach the line to his body. The two lines were anchored to a peg, well back from the face-edge, with the free ends thrown over the edge and the ropes lying close to where each man was working. When the ground, under their feet, gave way, one miner was able to grasp his life-line, and thus save himself from serious injury, but his mate failed to do so and was precipitated some 40 feet down the face, receiving injuries, from which he died about 4 hours later. It was estimated that about 100 tons of rock fell.

At the inquest the Jury returned a verdict of death from accidental cause and added a rider suggesting that the control and use of life-lines should be regulated by law.

A second accident occurred two months later when a miner, who was in charge of the party, received fatal injuries through being struck by a stone which rolled down the slope of the face.

Four hours prior to the accident, six toe-holes and ten bench-holes had been heavily bulled, and, after the face had been barred down, the party proceeded to load the holes with the main firing charges. Four men were engaged in charging toe-holes directly below a portion of the face, which had been severely shaken by the bulling, when a stone about 80 lbs. in weight, became detached and rolled some 40 ft. down the 60 degree batter, and struck the victim on the head and back, causing fatal injuries. Very bad weather conditions, combined with heavy rain and hail, had prevailed during the previous days and at the time of the accident. Within 18 hours afterwards, a fall of about two tons of rock occurred at the place where this accident had happened.

During the inquest, which lasted for two days, very searching questions were put to the various witnesses with the object of ascertaining the cause and prevention of such accidents. It was established that two miners had barred this ground down, after the completion of bulling, but the ganger-in-charge had not inspected the face by going over it himself. Some conflicting evidence was presented as to how the barring work had been done, and, in my opinion left a doubt that it had been properly carried out. The Jury returned a verict of death from accidental causes.

Three non-fatal accidents occurred to persons employed in connection with open-cut operations. A labourer, returning after work to the change-house jumped from a stationary truck, a distance of 4 feet to a road surface, when his foot contacted a small stone and caused his leg to twist. He sustained a fractured thigh and was unable to resume work for several months.

When proceeding to work in a passenger bus, a welder had the misfortune to have his finger caught in the door frame as the door shut. Septic conditions developed and necessitated an amputation of the finger. He was incapacitated for 60 working days.

A junior labourer, employed as a crib-house attendant, slipped and fell on a rock while walking down a path. He sustained injuries to the ribs. Pneumonia supervened and caused him to loose 40 working days.

Of the other surface accidents, four occurred at a reduction plant, and one each in a boiler maker's shop and a sawmill.

A shift-boss was severely burned on the neck, arms, and feet, when an explosion occurred whilst molten matte was being run from a furnace to a vessel. The cause of the explosion was considered to have been due to some water inadvertantly entering the vessel.

A convertor attendant slipped and fell on some jagged slag while he was attaching a crane hook to some metal. He sustained a lacerated forearm and was incapacitated for 44 working days.

Whilst repairing a lime-kiln, a labourer was engaged in stacking bricks on a scaffolding which collapsed. The man fell 30 feet, with the bricks, inside the kiln and received injuries to his head and leg which caused him to lose 23 working days.

A sampler, at an ore tipping station, attempted to stop a heavy rail-truck, which was moving very slowly, by putting a crowbar in front of a wheel. The bar caught in the undercarriage and caused him to overbalance and fall into the ore bin. He sustained injuries to the chest and arms and was incapacitated for 23 working days.

A labourer, at a boiler-maker's shop, placed a piece of timber against a truck, when the timber fell and fractured his great toe, causing him to lose 25 working days. A similar type of accident occurred at a saw-mill, when a piece of timber fell and crushed the great toe of an employee, causing incapacitation for 14 working days.

A miner was working underground when he tripped and fell about 12 feet down a ladderway. Head injuries and concussion prevented him from returning to work for about three months.

Safety.

Inspection work has been regularly directed to the production and maintenance of safe working conditions. Representations in regard to safety were made to all concerned as occasion demanded, and, in general, received a reasonable response.

In all mining operations strict attention was directed to the removal of unsafe ground before persons were allowed to work beneath it.

In underground operations, one controlled settlement of ground occurred over an area reinforced by square set timber and sand filling. A large block of ground settled about four feet, causing no damage of moment. In another stope, where the main gallery of a sill floor was in constructional progress, a local fall occurred, owing to the presence of an unsuspected weakness in a central rock pillar. This structural weakness consisted of a short greasy head in and close to the side of the rock pillar. The stope had been amply provided with bulks to support roof movement, but with the side pressure from the pillar wall caused the bulks to fail. Two gallery sets and ten or twelve bulks were crushed.

In order to ensure the safety of persons working in places where life-lines are required, consideration has been given to a set of rules to be included in the Mines and Works Regulation Act, so that proper controls may be maintained.

Ladderways, shaft equipment, lighting conditions, ore-pass coverings, angles of batter in open-cut workings, explosives in transit and in use, surface and underground transport, and many other details of mining practices have been regularly examined. In general, reasonably satisfactory conditions were maintained. In the crushing, milling and smelter sections of works and in the various extensive workshops allied with mining operations, similar care and inspection have been exercised.

Ventilation.

Ventilation of underground workings and surface buildings has received due attention. Owing to altered conditions of work in one underground mine, dust conditions became unsatisfactory at the tipping vents of a main ore pass. This condition developed because the main suction fan, ventilating the stopes, caused the air at the ore pass to be drawn into the mine when the circulation balance was upset as the stopes progressed towards the upper levels. On representations being made to the management, temporary alterations were immediately effected and an extensive alteration of the system was completed. This has resulted in satisfactory conditions being restored and has also given a better control of the whole ventilation system.

Health and Sanitation.

Regular supervision was maintained in connection with conditions affecting the health of employees in mines and works. Crib-places, changing and bathing accommodation and latrines have been kept in reasonably good order. Supervision has been exercised in the control of atmospheric dust arising from mining operations. Sound co-operation in support of this objective has been received from mine officials, but, at open-cut workings, it is suspected that some employees do not always use the appliances provided for suppression of dust. In such instances advantage is taken of the absence of responsible officials, and, owing to the open nature and extent of the workings, it is possible for an offender to commence using the appliance when an official is observed approaching. The matter has been discussed with Union Officials, who regard it with concern and have promised their support in preventing such occurrences.

First-aid stations have been kept in excellent order and effective work has been done by the officers in charge of this work.

Explosives.

No accidents or mishaps have occurred in the handling and use of explosives. Detonating fuse has been found very effective and is used in all open-cut primary blasting when supplies are available. It is regarded as being more efficient than electric detonation.

During the first month of the year an enquiry was conducted into the system of boring, loading, firing and prevention of mis-fires during secondary blasting. Some weaknesses in the system and practice were found and corrected. The enquiry was materially assisted by the preparation and circulation of a questionnaire, on routine matters, to the various employees. The questions were read and answered by a fair cross section of the employees and a reasonable assemblage of individual opinions was obtained.

Machinery.

Maintenance and protection of machinery and appliances received the attention demanded by the provisions of the Mines and Works Regulation Act. One accident occurred at a saw-mill when an employee attempted to remove saw cuttings from below a moving circular saw, by pushing with his foot. He slipped and his foot was cut by the saw. Enquiries and inspections have been made in the company with the Inspector of Machinery.

Prosecutions.

Legal proceedings were instituted against six persons for contraventions of the Mines and Works Regulation Act. Four persons were prosecuted for failing to use water to allay dust whilst operating rock drills at an open-cut working. Each offender was convicted, fined £3, and ordered to pay 8s. 6d. costs. An underground miner was proceeded against for failing to return unused explosives to the approved place of storage underground. He was convicted, fined £3, and ordered to pay 8s. 6d. costs. An employee was proceeded against for assault in a change-house, and was convicted, fined £5, and ordered to pay 8s. 6d. costs.

Explosives Act.

Supervision was maintained in respect of the importation landing, and transport of explosives.

Explosives landed at Regatta Point for Queenstown were:—

	lb.
Polar A.N. Gelignite 50″ x 1¼″	387,500
Polar A.N. Gelignite 50″ x 13″	24,900
Polar A.N. Gelatine Dynamite 75″ x ⅞″	22,500
Polar A.N. Gelatine Dynamite 75″ x 5″	11,500
Polar Quarry Monobel 1¼″	57,500
Total	503,900

	Number.
Detonators, No. 6 L/A	260,000
Detonators, No. 6 Electric	4,000
Fuse igniters	54,000
	Cases.
Safety fuse, in reels	300
	Feet.
Detonating fuse (primacord)	44,000

Unsatisfactory conditions were found when a cargo of explosives arrived at Regatta Point with several of the outer wood cases split or broken and with many of the other cases showing nails either drawn completely or propecting in a dangerous manner.

Representations were made by the Chief Inspector of Explosives to those concerned and satisfactory conditions were restored.

Otherwise, no satisfactory conditions were observed in the quality or condition, storage, transport and handling of explosives.

All safety fuses gave satisfactory tests as to burning rate and quality.

Detonating fuse has been found reliable and is considered to be more efficient than other types of explosives used as detonants.

Inflammable Liquids Act.

Inspections were made of premises licensed under the provisions of the Inflammable Liquids Act. Reasonable conditions have been maintained. No alterations were made to the storage capacities of the various depots.

The Workers' (Occupational Diseases) Relief Fund Act.

Certificates, indicating that 38 new employees were free from disease, were received and registered.

Applications were made by 79 persons for examination for industrial disease. In 13 instances, the applicants were found to be suffering from silicosis either in the primary or ante-primary stage.

A comparative analysis of the affected cases is as follows:—

	1944.	1945.
Incapacitated (affected by silicosis 100 per cent)	2	1
Partial Incapacity (over 50 per cent affection)	3	3
Partial Incapacity (50 per cent affection)	3	Nil
Partial Incapacity (under 50 per cent affection)	5	9
Total	13	13

The following tabulation illustrates the age and length of service in mining operations of the 13 persons who were found to be affected by silicosis during the year under review:—

Certified Incapacity due to Silicosis. Per cent.	Age of Person Affected. Years.	Length of Service in Mining Occupations. Years.
100	76	45 underground mining
70	47	15 underground, 5 surface
60	67	50 underground mining
60	42	15 underground, 2 surface
40	37	19 underground, 3 surface
20	59	31 underground
20	50	14 underground
20	50	12 underground, 14 surface
20	47	16 underground, 4 surface
20	45	14 underground, 3 surface
20	44	11 underground
20	39	10 underground
20	38	17 underground

General.—Industrial relations have continued on a reasonable basis in spite of the many difficulties encountered through wartime conditions.

A shortage of skilled and unskilled labour has prevailed.

Aid to Mining.—Various prospects of gold, copper, tin, mica and antimony have been examined and reported on in the district, and, although in some instances favourable indications were noted, no development of importance has yet been derived from this work.

Mining Operations and Production.

The Mount Lyell Mining and Railway Company Limited.—The output from all mines was 1,469,170 tons of ore, representing a decrease of 10,892 tons, as compared with the production of last year. Production fell 55,076 tons from underground mining and increased by 44,184 tons from surface operations.

Surface mining at the West Lyell group of mines, which included the West Lyell, Prince Lyell and Royal Tharsis sections, produced 1,391,037 tons of ore, representing an increase of 44,184 tons, as compared with the previous year.

In the underground section, production decreased by 44,936 tons of ore from the Royal Tharsis mine. This decrease was mainly due to the necessity for having to divert labour from ore production to timbering and forming new galleries on Nos. 2, 4, and 6 levels, as portions of the lower stopes advanced upwards to those levels.

No ore was broken at the Lyell Comstock mine, but 40 tons of copper precipitates was extracted from the mine drainage water.

Production increased by 511 tons at the North Lyell mine as the result of ore won from pillars.

The following tabulation represents the disposition of ore production:—

	Year 1944. Tons.	Year 1945. Tons.
West Lyell Open-cut Mines	1,346,853	1,391,037
North Lyell Mine	4,173	4,684
Lyell Comstock Mine	10,691	40
Royal Tharsis Mine	118,345	73,409
Totals	1,480,062	1,469,170

Underground mining work was restricted to ore breaking for production.

At the open-cut workings, the rate of overburden removal lagged during the war years because of plant and labour shortages, and, in order to implement the Company's planned output of 6000 tons of low grade ore daily, it is necessary to substantially increase the mechanisation of the open-cut plant to enable the excess overburden to be removed.

To maintain a throughput of 6000 tons it will also be necessary to make additions to the coarse crushing and milling sections.

Additions to open-cut equipment, placed in commission this year, include four 20 ton semi-trailer trucks, two bulldozers and a road-grading machine.

Diamond drilling was continued for the purpose of testing and checking the known ore reserves at the West Lyell mines.

In addition to the ore mined at the open-cut workings, 280,817 tons of overburden was broken and transported to dumps, making a combined total of 1,671,854 tons of material removed.

At the Reduction Works, the concentration plant operated for 353 days and processed 1,464,446 tons of ore for an extraction of 32,396 tons (dry) of copper concentrates and approximately 44,928 tons (dry) of pyritic concentrates. The copper concentrate was smelted and 40,160 tons of pyritic concentrate was shipped from Regatta Point for use in acid manufacture.

The smelting plant treated the copper concentrate, together with 4684 tons of high grade ore and a quantity of precipitate copper, recovered from the water from the mines, and produced 7246 tons of blister-copper.

Under normal running, the refinery processed the blister copper for an output of 7197 tons of electrolytic copper. The cell residue was shipped for treatment and returned 24,241 oz. of silver and 4853 oz. of gold.

Productive activities of the Mount Lyell Company are shown in the following comparative tabulation:—

	1944.		1945.	
	Weight.	£	Weight.	£
Copper (Electrolytic) ..	9,831 tons	609,522·000 S.	7,197 tons	446,214·000 S.
Silver	38,047 oz. f.	3,994·935 S.	24,214 oz. f.	2,914·536 S.
Gold	6,443 oz. f.	54,121·200 S.	4,853 oz. f.	41,448·670 S.
Pyritic Concentrate (shipped)	29,136 tons	36,420·000 A.	40,168 tons	50,210·000 A.
Limestone (quarried) ..	6,268 tons	2,388·575 A.	5,171 tons	2,415·412 A.
Silica (quarried)	5,386 tons	2,318·001 A.	4,199 tons	1,904·311 A.

S. = Sterling value A. = Australian currency. f. = fine.

Gold.—Mr. E. Tripp, working intermittently in spare time, obtained 1·476 oz. valued at £12·398 sterling from various creeks in the district. This combined with the production of the Mount Lyell Company gives a total yield of 4,854·476 oz. fine, valued at £41,461·068 sterling.

Inspector L. F. Egan, Upper Burnie, reports:—

Employment.—The average number of men employed in mining, quarrying, and metallurgical activities was 793, as compared with 855 for the previous year. Continued diversions of labour to other industries and a lack of new labour to meet developmental and productive requirements severely retarded progressive developments in mining.

Accidents.—Total number of accidents registered was 15. An examination of these shows that two men on different mines were injured in the same way by falling rock while actually engaged in the task of scaling or barring down the "back." Another man while pulling a truck loaded with ore towards him backed into a chute lip and was jammed between the hood of the truck and the ore chute.

In the same category may be placed the accident to a man coupling a rake of trucks underground when the trucks running back to the limits of their connecting shackles jammed the victim between the gallery leg and truck.

In another instance, a miner was barring ore through a grizzly at the bottom of a rill stope, when a large piece of ore "rode" the bar and fell on his right foot.

Probably the most serious accident for the year occurred when a miner attempted to untwist the scraper ropes in a stope at precisely the same moment that the scraper hoist driver, unaware of what his mate was doing, started up the hoist. The accident victim's left hand was drawn into the anchor block of the scraper rope and injuries were inflicted which later necessitated the amputation of the second, third, and fourth fingers.

While loading aerial buckets a man was struck by a stone which fell from the chute crushing the little finger of the right hand. A crushed index finger of the right hand resulted from a man's finger being jammed between the shank of a steel and the nose of his jack hammer.

An injured knee resulted from a man's foot slipping while lifting a turntable on a non-metallic lease. The turntable fell across the man's knee inflicting injuries requiring his absence from work for a period of some months.

In the majority of cases the accidents have been due to unanticipated happenings and no blame has been attachable to any person.

Safety.—Throughout the year there was no relaxation of care in the effort to prevent accidents. The nature and small number of accidents which have occurred more than justify this policy. At the same time, when accidents have been reported the circumstances surrounding them have been investigated with a view to preventing a repetition of the same thing. Where applicable, these preventative measures have been immediately instituted. Herein, it must be stated that the co-operative spirit of the managements of the larger mines has made the task of accident prevention much easier.

Health and Sanitation.—Dry crushing and ineffectual dust collection on one large scale metallurgical plant made for unhealthy working conditions. Constant pressure was applied to bring about a rectification of this nuisance, and the management effected alterations and carried out much experimental work with this purpose in view. Conditions at this plant at the end of the year were still far from satisfactory, and efforts during 1946 must be directed to the elimination of these unhealthy conditions.

On three West Coast mines improvements were effected to change houses and crib places, resulting in healthier and more congenial conditions for the users.

Ventilation.—This aspect of inspection work was watched carefully during the year, and generally speaking, the standard achieved was reasonably satisfactory. On two occasions on two large West Coast mines it was found necessary to require the introduction of more satisfactory ventilating appliances in drives.

Explosives.—Every care was exercised to ensure safety in the importation, carriage, handling, and use of explosives. Direct supervision was exercised over the importation and landing of explosives at the Port of Burnie as required, and no unusual or untoward incidents were associated with these operations.

A strict watch was kept on licensed magazines and in certain instances the licensees were required to effect repairs, cut back encroaching scrub, &c.

No instances or defective explosives were encountered during the year.

Inflammable Liquids.—Towards the latter end of the year several new sites were approved for petrol installations to be proceeded with. Throughout the year the provisions of the Inflammable Liquids Act were enforced and in no instance was it found necessary to institute legal proceedings.

Machinery.—For the purposes of satisfying the provisions of the Mines and Works Regulation Act, relating to machinery, effective collaboration has been maintained with the Inspector of Machinery. Underground mining machinery, ropes, &c., have received close attention. In metallurgical and smelting plants a strict watch has been kept for potential danger points and wherever noted safety precautions in the form of guards, railing, steps, &c., have been introduced.

Prosecutions.—One man was prosecuted for alighting from a moving vehicle, a passenger car on a haulage tramline while not directly employed with such means of transport. He was fined £2, and costs were assessed at 8s. 6d.

The Workers' (Occupational Diseases) Relief Fund Act.—Three applications for compensation were received. In one instance the applicant who had been mining for over 20 years was found to be incapacitated to the extent of 60 per cent silicosis within the meaning of the Act.

The two other applicants were men leaving the mining industry, and in one case the man was found to be suffering from silicosis in a degree insufficient to incapacitate while the other person was found to be free from disease.

Mineral Resources.—Assistance to the extent of £10 on a £1 for £1 basis was afforded to one West Coast prospecting party for the purpose of cutting a track to their mine. In another instance a report was prepared on a silver lead prospect at Zeehan. At the request of the Director of Mines, a comprehensive survey was undertaken of mineral prospects which had been forced to be dormant during war years. In the assembling of this information, responsible mining men throughout the inspectorate were interviewed, prospects were visited and reports were prepared. It is anticipated that portion at least of this work will bear fruit in the coming year.

MINING OPERATIONS AND PRODUCTION.

Asbestos.—The extraction of chrysotile (asbestos) fibre from ore broken in exploratory and development work was continued throughout the year at the Tasmanian Asbestos Company leases. A total of 6963·5 tons of crude serpentine ore was treated for the recovery of 276·36 tons of fibre, valued at £7193. An average of 27 men was employed during the period. The close of the year marked the termination of testing operations by the company and it was decided to cease operations.

Cadmium.—The total production of cadmium for Tasmania (29·38 tons), was derived from ore produced from the Read Rosebery mines of the Electrolytic Zinc Company of Australasia Ltd. The value of this was £13,161.

Clay.—Apart from clays used in the manufacture of bricks, 2681·5 tons of white clay valued at £3527·5 were produced in the Hellyer area for use in the manufacture of paper by the Associated Pulp and Paper Mills at South Burnie. In the last quarter of the year operations at Hellyer were suspended, the reasons being that the quality of the product had deteriorated and that adequate supplies of better quality clay has been secured in another part of the State.

The average employment figure was 3.

Copper.—Production of copper amounted to 275·51 tons and resulted from the metallurgical treatment of the zinc lead ores of the Read-Rosebery mines of the Electrolytic Zinc Company of Australasia Ltd.

Dolomite.—A systematic diamond drilling campaign of known occurrences of dolomite in the Smithton area was commenced by the Tasmanian Government Mines Department and it is anticipated that drilling will continue into 1946.

Gold.—Gold mining received little attention during the year, the only producer being the Electrolytic Zinc Company of Australasia Ltd. in the treatment of the zinc lead ores of the Read-Rosebery field.

From this source 7478·67 oz. of gold were produced valued at £63,866.

Some desultory prospecting was carried out at Doctor's Rocks, Seabrook, and Cam, but no sales were recorded.

Osmiridium.—Production of osmiridium was limited to the 5-mile area, from which 5·117 oz. valued at £125 were recovered. Intermittent employment was afforded to two men by this means.

Ochre.—Interest in the mining of yellow ochre declined during the year, the only output being 4·5 tons valued at £30 from the Deep Creek deposit at Smithton, and Pearson's workings at Penguin.

Quarrying of red ochre was continued at Spalford, and 61 tons were obtained yielding a return of £161.

Silica.—The Ulverstone area provided the total output of one ton, valued at £2·5, the parcel being for experimental purposes by a mainland firm.

Limestone.—More correctly described as lime sand, 367 tons, valued at £269, were mined from pits in the vicinity of Smithton.

Talc.—Mining of high grade talc at Gawler afforded employment for three men, 152·75 tons being sold to mainland buyers for £532.

Scheelite.—King Island Scheelite N.L., Grassy, King Island.

The general manager reports as follows:—" The development work on the quarry consisted of opening up to full width six benches at 20 feet intervals from 50 feet above sea level. Sand and rock overburden has been removed as necessary to allow the proper development of these benches. Two 2½-yard shovels and six 6-ton trucks were used on this work, together with a D.8 bulldozer.

The ore milled was 94,100 tons, concentrates produced totalled 527·54 tons, containing 348·35 tons of W.O.3, valued at £158,093·5 sterling.

Plant modification was carried out throughout the crushing plant and mill to bring the tonnage capacity up to 10,000 tons per month.

Power supply was from two 400 kw diesel generating units, which are inadequate for the whole plant operating at once and allow no spare for maintenance. A third set has been ordered to provide a spare set and sufficient power.

The construction of houses has been continued and the total of 60 are complete, and a programme of six under construction. The construction of a recreation oval is complete and a progressive programme of amenities is planned for next year. This company was the only producer of scheelite for the territory."

Silver Lead.—Farrell Mining Company, Tullah.

The following information was made available by the courtesy of Mr. D. R. Midson, General Manager:—

Crude ore mined and milled, 7116 tons.

Marketable ore produced, 1620 tons of lead concentrate, containing 1161 tons of metallic lead and 136,390 oz. fine silver.

Average number of men employed, surface 30, underground 29.

Power.—The Hydro-Electric power gave very efficient service, no major interruptions being experienced during the year.

Treatment Plant.—Throughput was limited to the ore available and the plant was not run up to capacity.

Mining Operations.—Development No. 8 Level. In order to test the downward continuation of the ore worked at No. 7 Level, a winze was sunk in the hanging wall of the lode at No. 7 level, and a plat opened out at 102 feet. An electrically driven winch was installed for hauling material and the lode at No. 8 Level was driven on for 17 feet. North and 33 feet south, further driving being necessary before values are expected.

No. 7 Level, North.—A rise was connected to No. 6 Level for ventilation purposes and holed through in 103 feet.

No. 5 Level, North.—The intermediate drive was extended and a rise holed through to No. 4 Level on 12 inches of payable ore.

No. 3 Level, North.—A rise was connected from No. 3 Level to the north stope, which had been extended south as it rose towards No. 2 Level, the rise serving as an ore pass for the stope.

No. 2 Level, South.—A crosscut was driven in the footwall for 53 feet, and a drive opened out on a formation for a distance of 16 feet, but this was abandoned pending a test with the diamond drill.

No. 1 Level, South.—A drive was opened out from the east crosscut to test the Macintosh lode and was advanced south for 88 feet without proving payable values.

No. 1 Level, North.— A crosscut was sent out 57 feet into the footwall in black slates, the mullock being used for filling No. 2 stope. No values were intercepted.

Stoping.—The following tonnages were broken from the various stopes during the year:—

	Tons.
No. 7 Level, north stope	100
No. 7 Level, south stope	673
No. 6 Level, south stope	202
No. 5 Level, north stope	949
No. 4 Level, branch stope	570
No. 3 Level, north stope	1626
No. 2 Level, north stope	2849
	6969
From development work	147

Diamond Drilling.—A diamond drilling programme was carried out in the underground workings and 2000 feet of lateral drilling disclosed several promising formations which will be tested when conditions are favourable.

Main Headframe.—The headframe on the main shaft was completely overhauled and a new leg and other timber renewed where necessary.

Tin.—Production for the whole of the inspectorate totalled 139·348 tons of metallic tin, valued at £41,803 sterling. The main contributors were Renison Associated Tin Mines N.L. and Mt. Bischoff Tin Mine, the latter operating under the direction of the Commonwealth Directorate of Minerals Production, Department of Supply and Shipping. Apart from these two producers, fossickers and small parties were responsible for the production of 1·016 tons of metallic tin, valued at £440·619 sterling.

Mount Bischoff Tin Mine, Waratah.

The following report of activities was received from the manager:—

Ore mined for the year totalled 48,260 tons. Of this the North Valley workings contributed 15,975 tons, whilst from the workings on the southern slopes, 30,228 tons were obtained from the Pig Flat Face, and 2,057 tons from the Greisen ore body.

Total tonnage milled for the year was 45,316 tons from which 94·858 tons of pyritic concentrates were recovered. These concentrates yielded 61·862 tons of metallic tin.

	Tons.
Pyritic concentrate recovered	94·858
Metallic content	61·862

Tributers operating in the alluvial workings in the Waratah River at North Valley contributed a further 3·242 tons of metallic tin.

Development.—A total of 280 feet of development was effected during the year and is as follows:—

	Driving Feet.	Rising Feet.
North Valley, No. 5 Level	....	8
North Valley, No. 7 Level	133	....
Greisen Lode	30	109
	163	117

Development work was discontinued between the months of January and October.

Employment.—The average number of men employed during the year was 110.

General.—Towards the end of the year plans were finalised for the purchase of the leases and plant from the company by the Federal and State Governments conjointly and the project to be operated by a Board of Management appointed by both Governments.

Ritchie Creek.—Fossickers at Ritchie Creek sold ·027 ton of tin concentrates, containing ·015 ton of metallic tin, valued at £4·647 sterling.

Tinstone Creek.—L. Glozier working in Tinstone Creek recovered ·092 ton tin concentrates, of which the metallic content was ·038 ton, valued at £11·421 sterling.

J. S. Fenton, M.L. Renison Bell.—Sluicing ground of varying values, Mr. Fenton obtained ·342 ton of tin concentrates containing ·200 ton metallic tin. The value of this was computed at £61 sterling. Work was not continuous throughout the year.

J. Pepper, Renison Bell.—Operating for the first quarter of the year only, ·042 ton of tin concentrates were produced from Pine Hill. Metallic content was ·024 ton, valued at £7 sterling.

Razor Back Tin Mine, Dundas.—In the first quarter of the year operations under the terms of the working option granted to Mr. E. Brock, were continued, but at the end of the testing period the option of purchase was not exercised. The hope is expressed that further attention will be paid to this ore body.

The Grand Prize Mine, The Five-Mile.—Messrs. Casey and Smith, operating at odd times during the year, produced ·453 ton of tin concentrates, containing ·230 ton of metallic tin, the sterling value of which was £69. The operations of these two men covered six months of the year.

J. Wallace.—Operating at the Five-Mile for a short period, he obtained concentrates containing ·03 ton of metallic tin, valued at £8·973 sterling.

North Mt. Heemskirk.—Mr. R. A. Smith, working for nine months of the year produced ·245 ton of tin concentrates, valued at £54·058 sterling, metallic content being ·164 ton.

Mr. H. G. Watson's return for three months work during the year on the old Eureka Tin Mine was ·366 ton of tin concentrates, of which the metallic content was ·086 ton, valued at £32·336 sterling.

The only other production from this field was by Mr. J. Dixon, who obtained ·048 ton of tin concentrates, containing ·024 metallic tin, valued at £7.

South Mt. Heemskirk.—E. Coleman's leases were tested by the Mt. Lyell Company operating under a working option.

About 110 feet of driving was done as well as some rising. On the conclusion of testing operations the right to purchase was not exercised.

Balfour Area.—No production was recorded from this area during the 12 months.

Renison Bell Area.—Renison Associated Tin Mines. The General Manager reports as follows:—

Production of tin was continued throughout the year, but an acute shortage of labour necessitated the milling plant being worked two shifts only, instead of the usual three.

Crude ore totalled 10,656 tons dry weight, from which a recovery of 117·054 tons of tin concentrates was obtained. From these concentrates 76·207 tons of metallic tin, valued at £22,862, were obtained.

Production of crude ore during the period was confined to the Battery faces and Dalcouth workings, the greater production coming from the Battery faces.

Development work carried out on the Battery face during the year has proved this section of the mine. This is shown by the fact that the average grade of ore milled has been over 1 per cent tin.

The labour position has deteriorated during the 12 months, and although the extension to the milling plant has been completed, there is not sufficient labour available yet to operate same. Consequently, the expected improvement in recoveries of oxide from the additional new plant has not so far been achieved.

Further developments of the ore bodies as planned originally has been held back on the same account.

The mine generally is in good shape and a much larger output can be achieved when the necessary labour is available.

A. J. Salmon, M.L's., Exe Gorge.—Mr. Salmon's operations during the year were mainly confined to prospecting the unexplored portions of his leases. Surface indications point to a quartz lode system consisting of at least two parallel bodies, the larger of which is approximately 12 feet wide. Exposures of this have been made for at least 20 chains along the surface. The narrower parallel body, where exposed, is approximately six feet wide and carries free tin. Production for the year was ·048 ton of tin concentrates containing ·032 ton metallic tin, valued at £10 sterling.

J. Copping, Exe River.—Working single-handed on the lenticular quartz ore bodies on his Exe River leases, Mr. Copping obtained ·139 ton of tin concentrates by crushing and concentrating the ore on his small stamp and tabling outfit. The metallic content of this was ·064 ton and was valued at £18 sterling.

Zinc, Lead, Copper Ores.

Electrolytic Zinc Company of Australasia Limited, Rosebery, Williamsford, and Zeehan.

The Hercules Mine produced 39,174 tons of ore and the Rosebery mine produced 69,632 tons. This total of 108,806 tons was treated in the Rosebery Concentrating Plant for a recovery of 32,657 tons of zinc concentrates, 6902 tons of lead concentrates, and 3097 tons of copper concentrates.

The ultimate extraction of metals from these concentrates was as follows:—

Metal.	Weight. Fine Ozs.	Value in £ (Sterling).
Gold	7,478·67	63,866
Silver	655,535·38	81,996
	Tons.	
Copper	275·51	17,080
Lead	5,137·44	128,434
Zinc	15,609·34	407,307
Total		£698,683

In addition to the foregoing, 29·38 tons of cadmium were extracted, valued at £13,161.

An average of 358 men derived employment from the Mines and Works at Williamsford and Rosebery, while the average number engaged at the Smelters at Zeehan was 28.

Electrolytic Zinc Company of Australasia Ltd., Rosebery.

The following particulars were supplied by Mr. F. G. Burns, Mine Superintendent:—

Diamond Drilling.—Rosebery and Hercules Mines—

	ft.
Rosebery Mine	3629
Hercules Mine	5485
	9114

No major ore occurrences were disclosed by drilling, but useful information was obtained and extensions of known ore-bodies proved. Several holes were put down in the Dunn's Blocks area, but these did not disclose any ore.

Prospect Drilling.—Footage bored during the year ended 27.6.45, 718 feet.

This drilling was done on the Black P.A. and Salisbury areas. Apart from tin values on the Black P.A. area, mentioned in last year's report, no ore was intersected.

Development.

Rosebery Mine.—The following is a summary of development footages:—

Driving.	Crosscutting.	Rising.	Winzing.	Total.
Feet	Feet	Feet	Feet	Feet
575	59	119	Nil	753

Hercules Mine.—The following is a summary of development footages:—

Driving.	Crosscutting.	Rising.	Winzing.	Total.
Feet	Feet	Feet	Feet	Feet
86	34	86	Nil	206

Ore Production.—Ore production and development work were again below normal, owing to shortage of manpower.

Remarks.—No fatal accidents occurred during the year.

There has been no major change in mining methods. A considerable yardage of overburden has been removed from the opencuts to allow the ore to be broken by "opencut" methods.

Inspector R. J. Muir, Launceston, reports:—

I have the honour to furnish the following report upon the work of inspection and administration of the provisions of the Mines and Works Regulation Act, the Explosives Act, and the Inflammable Liquids Act within the Launceston Inspection Division for the year ended 31st December, 1945.

On my arrival in Tasmania I was appointed to the Launceston Inspectorate and took over the duties of inspector from Mr. L. F. Egan who had been transferred to Burnie at the commencement of the year.

Employment.—The average number of men employed in mining and metallurgical operations, other than coal mining, was 750 as against 882 the previous year, the decrease being due to wartime conditions and more remunerative work offering in other industries.

Accidents.—Four accidents only were registered under the Mines and Works Regulation Act, compared with 13 for the previous year. In no case were the injuries of a fatal nature. Two of the accidents occurred underground and two happened on the surface. In both underground accidents the cause was due to a fall of rock, the injuries received being a compound fracture of left leg, in the first case, and lacerations to the 2nd, 3rd, and 4th fingers of left hand, with later amputation of the tip of the 2nd finger, in the second case. The surface accidents occurred, in the first case, when timber being loaded on a trolley slipped and lacerated the right forefinger of an employee; and, in the other case, when trucks loaded with pipes, became de-railed and jammed an employee's leg causing a fracture above the knee. The low number of accidents reflects creditably upon the general conduct of mining operations.

Safety.—The larger metalliferous mines and quarries commanded the greater number of underground and surface inspections but, as opportunity permitted, the smaller mines received attention. Co-operation was received in all cases and any matters that were considered unsatisfactory were rectified without undue delay. Extra care was necessitated at one of the large alluvial mines during the winter months due to the excessively wet weather experienced, but, though there were minor hold-ups, work continued throughout the period.

A number of safety innovations was made at the underground mines and operated satisfactorily.

Health and Sanitation.—Whilst most of the larger mines have crib houses and change houses of a satisfactory type installed, constant care and attention were necessary to see that they were kept in a clean and tidy condition.

The control of dust underground in mines was reasonable and it was only necessary on two occasions to speak to miners about not watering down the dust sufficiently.

A dust collecting plant was installed as part of a new mill installation, completed during the year.

Assistance was rendered throughout the year to the Chairman of the Workers' (Occupational Diseases) Relief Fund Board in having the necessary examinations of underground workers carried out.

Explosives.—Personal supervision was exercised over the importation of explosives at Launceston. The Marine Board at Devonport supervised importation at that port. In all cases a satisfactory certificate of analysis was produced and unloading was carried out without undue incident. The explosives were in good order and condition with the exception that in a few instances some cases had become slightly damaged in shipment. No reports of defective explosive or safety fuse were received from the inspectorate throughout the year.

Machinery.—Co-operating with the Inspector of Machinery, all mining machinery was periodically inspected. With the exception of a new mill and a new dredge, which commenced operations at the end of 1944, there was very little new machinery installed on account of wartime conditions. Safety guards and rails &c., were installed as requested in the few instances deemed necessary.

Inflammable Liquids.—Considerable time was taken up with duties under the Inflammable Liquids Act, and the full duties of administration and inspection commanded more time than it was possible to allot thereto.

One untoward incident was reported by the Marine Board, Devonport, which supervises the importation of inflammable liquids at that port. A tanker discharged a considerable quantity of kerosene into the harbour. The matter was investigated and a report forwarded to the Chief Inspector.

With the cessation of the war there was a number of new installations and numerous enquiries were received and answered in connection with the storage of inflammable liquids by people who anticipated an early lifting of petrol rationing.

Aid to Mining.—In addition to ordinary duties, examinations were made and reports furnished in connection with mining properties for the purpose of the Aid to Mining Act. Where possible advice was also given to miners regarding the possible improvement in the economical working of their small mines. Reports were also furnished on matters of a miscellaneous nature from time to time as they eventuated, such as river pollution, leasing of land in mining areas, &c.

Mining Operations and Production.

TIN.

There was little fluctuation in the quantity of tin produced compared with the previous year, the output being 658·0931 tons metallic tin valued at £197,427·93 sterling compared with 653·72 tons for 1944. Average sterling price for tin remained constant at £300 throughout the year.

W. X. X. Mine, Moorina (A. W. Bird).—Production was slightly less than for the previous year due to difficulty in obtaining suitable labour. An average of 5 men was being employed and 7·8315 tons tin concentrate, containing 5·2498 tons metallic tin valued at £1574·94 sterling, was produced as compared with 6·6755 tons metallic tin for 1944.

Miscellaneous, Moorina.—There was an average of 2 men engaged in and around Moorina on small mines, producing 0·1656 ton of tin concentrate, containing 0·1004 ton metallic tin valued at £30·12 sterling.

T. H. Bryce and Sugden, Weldborough.—This party carried on mining operations throughout the year with their sluicing plant, handling 5600 cubic yards of ground for a recovery of 1·2961 tons tin concentrate, containing 0·9158 ton metallic tin valued at £274·74 sterling.

Waverley Mine, Weldborough.—V. A. Walker, owner of this mine was unable to obtain labour to work the large face, and carried out prospecting operations from which he obtained 0·4585 ton tin concentrate, containing 0·3176 ton metallic tin valued at £95·28 sterling.

Miscellaneous, Weldborough.—Other small mines in the district gave employment to an average of 7 men and produced 2·6970 tons tin concentrate, containing 1·6956 tons metallic tin valued at £508·68 sterling.

Anchor Mine, Lottah.—This mine was worked throughout the year by a local syndicate which was hampered by shortage of labour but nevertheless treated 3210 tons of ore to recover 8·2303 tons tin concentrate, containing 5·8547 tons metallic tin valued at £1756·41 sterling. The mine employed an average of 5 men.

Miscellaneous, Lottah.—An average of one man was employed in and around this district in prospecting operations. In the last quarter one parcel of 0·2531 ton tin concentrate, containing 0·1829 ton metallic tin valued at £54·87 sterling, was obtained.

Miscellaneous, Goulds Country and Goshen.—Small mines in this district gave employment to 3 men and production amounted to 0·6665 ton tin concentrate, containing 0·4391 ton metallic tin valued at £131·73 sterling.

Albion Tin Syndicate, Priory.—This syndicate commenced operations on some alluvial ground near Priory, using a gravel pump and pressure pump for the nozzle—both driven by diesel engines. Production commenced in the second quarter of the year and continued throughout to produce 3·1361 tons tin concentrate, containing 2·0596 tons tin oxide valued at £617·88 sterling. Employment was given to 4 men.

Goshen Tin Mines, St. Helens.—Twenty-four men were employed throughout the year working the Bog No. 2, Argonaut and George's Bay faces. Work at the Groom River face having been abandoned, operations continued normally at the three faces, using the usual sluicing methods. The production of 48·1772 tons tin concentrate, containing 35·5549 tons metallic tin, valued at £10,666·47 sterling, was a satisfactory increase on previous years work when 28·19 tons metallic tin resulted from productive sluicing.

Bell Creek Tin Mine, St. Helens.—Kirwin Bros. continued operations when water was available for sluicing purposes. An output of 7·1125 tons of tin concentrate, containing 5·2476 tons metallic tin valued at £1574·28 sterling, resulted from the treatment of 12,000 cubic yards of alluvial material. Average employment was 4 men.

Miscellaneous, Priory, St. Helens, Scamander.—An average of 5 men carried out mining and prospecting operations at the small mines in these districts, their total production amounting to 1·1507 tons tin concentrate, containing 0·6436 ton metallic tin valued at £193·08 sterling.

Aberfoyle Mine, Rossarden.—Considerable improvements were carried out at this mine during this year, the most notable being the completion of the new mill which had been built around the old mill without the loss of production time. The new mill came into operation during April and by the end of the year the old mill had disappeared and finishing touches were being applied to the new one. Social Services, for the employees were not forgotten and the Company continued with its progressive policy. Development on the lower levels was held up by the non-delivery of pumping equipment, production for the year coming from above No. 4 level. Ore mined and milled amounted to 20,213 tons from which the tin production was 343·4681 tons tin concentrate, containing 244·7207 tons metallic tin valued at £73,416·21 sterling. An average of 97 men was employed and the common difficulty of obtaining labour had to be contended with.

Storey's Creek Tin Mine, Storey's Creek.—The production of Wolfram was the main consideration throughout the year and those lodes containing a predominance of this mineral were developed, particularly the No. 2 lode, work being carried out down to the No. 5 level. Tin production for the year amounted to 21·5 tons tin concentrate containing 13·9 tons of metallic tin, valued at £4170 sterling. Eighty men were employed to produce 11,333 tons of ore from which the above production was obtained.

The erection of the new mill and sinking of a new main shaft did not proceed, as was anticipated, owing to labour and supply difficulties.

Miscellaneous, Storey's Creek, Avoca.—0·2728 ton tin concentrate, containing 0·1989 ton metallic tin valued at £59·67 sterling, was produced by 2 men working small shows in these districts.

Miscellaneous, Scottsdale.—Very little production was obtained from this district although an average of 4 men were employed in intermittent prospecting. Collectively they produced 0·77 ton tin concentrate, containing 0·4575 ton metallic tin valued at £137·25 sterling.

Miscellaneous, Ringarooma.—There was very little mining activity in Ringarooma district but, towards the end of the year, there were signs of a revival of interest. Production from small parties, aggregating 4 men, was 0·815 ton of tin concentrate, containing 0·5695 ton metallic tin valued at £170·85 sterling.

Arba Tin Mine, Branxholm (W. A. Walsh) Branxholm.—Sluicing was continued at the Groper face, 9 men being employed. It was necessary to work some old ground and production declined in consequence. Compared with an output of concentrate containing 19·16 tons of metallic tin for the previous year, 21·1964 tons of tin oxide, recovered from sluicing, contained 15·7557 tons of metallic tin, valued at £4726·71 sterling.

Baker's Discovery, Branxholm,—Sluicing operations are limited at this mine to an average of about 3 months of the year owing to an inadequate water supply. During this period 3 men were employed and production for the year amounted to 2·7787 tons tin concentrate containing 1·7883 tons metallic tin valued at £536·49 sterling.

Ruby Flat Mine, Branxholm, (O. J. Walsh and Ebrall).—Employment was given to 5 men, and water was available for sluicing operations over practically the whole of the year. 6·0272 tons concentrate was produced containing 4·2793 tons metallic tin valued at £1283·79 sterling.

Miscellaneous, Branxholm.—1·2471 tons concentrate containing 0·8169 tons metallic tin valued at £245·07 sterling was obtained from small alluvial mines in this district, which gave employment to 8 men.

Briseis Mine, Derby.—Continuous operation was carried on throughout the year but the abnormal rains in the winter months caused much overburden to be washed down into the drift face which seriously hampered production operations and increased costs. However, 232·9 tons of tin concentrate containing 167·68 tons metallic tin valued at £50,304 sterling was produced, a drop of 23·46 tons in the metallic tin output compared with previous year's figures. Employment figures for the year showed an average of 124 men employed. The overburden removed for the year amounted to 271,000 yards and drift treated was 790,000 yards.

Miscellaneous, Derby.—The small mines of this district produced 2·2602 tons concentrate containing 1·5059 tons metallic tin valued at £451·77 sterling. Five men were employed the largest producer being J. Hornby's party who commenced operations during the year near the old "Valley" mine.

Miscellaneous, Herrick and Winnaleah.—1·3157 tons tin concentrate, containing 0·9460 tons metallic tin valued at £283·80 sterling, was produced by the two men working in this district.

Banca Tin Mine, Winnaleah.—The formation of a company to work this mine did not eventuate and T. B. Dutton, working alone, produced 1·0116 tons concentrate, containing 0·7008 ton metallic tin valued at £210·24 sterling.

Dorset Terraces, Bradshaws Creek.—Operations during the last three quarters of the year produced 1·9249 tons tin concentrate, containing 1·3782 tons metallic tin valued at £413·46 sterling.

H. V. and L. Woods, Bradshaws Creek.—Two men were continuously employed in handling 10,600 cubic yards of ground by sluicing, for a recovery of 6·1054 tons tin concentrate, containing 4·4786 tons metallic tin valued at £1343·58 sterling.

Eastern Leads Mine, Bradshaws Creek.—W. J. Ponting and Sons worked steadily during the year with an average of five men employed, a small amount of gold being obtained in the alluvial wash along with the tin oxide. Production from 9790 cubic yards of ground treated amounted to 5·0660 tons concentrate, containing 3·7621 tons metallic tin valued at £1128·63 sterling. Alluvial gold extracted from the concentrate returned 4·308 oz. fine.

Miscellaneous, Bradshaws Creek and South Mt. Cameron.—Men employed on small shows varied from 1 in the first quarter to 6 in the last quarter, with an average of 3, who produced 1·3229 tons concentrate, containing 0·9607 tons metallic tin valued at £288·21 sterling.

Dorset Dredge, South Mt. Cameron.—This new installation which came into operation at the close of 1944, worked satisfactorily on 3 shifts throughout the year to treat 1,590,700 cubic yards of alluvial material from the Dorset Flats. This modern Electric Bucket Dredge, operating from the Hydro-Electric Commissions Line, is a decided uplift to mining on the North-East coast of the State and its production of 135·5396 tons concentrate, containing 97·9703 tons metallic tin valued at £29,391·09 sterling together with its alluvial gold production, shown under gold, is an asset to the State's mineral production for the year. Employment was given to 44 men.

Endurance Mine, South Mt. Cameron.—Production for the year was mainly confined to the first quarter when the working of shallow ground on the north end of the leases was completed, production being 20·2826 concentrate, containing 21·5515 tons metallic tin valued at £6465·45 sterling. The main work of the year was the completion of the re-erection of the Electric Barge at a new site on the Clifton face. The transfer was completed towards the end of the year and sluicing was commenced to lower the barge to the level of the bottom of the wash.

Mt. Cameron Water Race, Gladstone.—The Government race continued as an important factor in tin mining operations in the Gladstone area, water from the race enabling 13 men to carry out mining operations on a royalty basis, producing, from 41,110 cubic yards of ground treated, 15·4118 tons tin concentrate, containing 10·9294 tons metallic tin valued at £3278·82 sterling.

Star Hill Syndicate, Gladstone.—This syndicate obtains its water from Mt. Cameron Water race on a contract basis. Production was very low, most of the year being spent in building a dam and installing new electric pumps to replace the steam driven plant. The power from the Hydro-Electric Commission's lines was connected to two 125 H.P. motors driving the Thompsons pressure pumps, during November, and sluicing commenced with two nozzles. No clean up had taken place by the end of the year. Average number of 3 men was employed and production amounted to 0·2589 ton concentrate, containing 0·1865 ton metallic tin valued at £55·95 sterling.

Miscellaneous, Gladstone.—Apart from those men obtaining water for sluicing operations from Mt. Cameron Water race, 13 men found employment on small mines, sluicing shallow ground, and producing 5·3133 tons tin concentrate, containing 3·5751 tons metallic tin valued at £1072·53 sterling.

Strait Islands.—Production for the year was confined to 1 producer on Cape Barren Island. He recovered 0·4385 ton tin concentrate, containing 0·3102 ton metallic tin valued at £93·06 sterling. Four others found employment prospecting on Cape Barren and Flinders Island.

Shepherd and Murphy Mine, Moina.—This mine operated both with surface sluicing and underground mining in a small way, giving employment to 4 men who produced a mixed concentrate. Tin production was 1·7246 tons concentrate, containing 1·1164 tons metallic tin valued at £334·92 sterling.

F. G. Townsend, Moina.—Working alone, this person carried out sluicing operations to produce tin, wolfram and bismuth concentrates. Tin-oxide produced contained 0·2699 ton metallic tin valued at £80·97 sterling.

WOLFRAM.

Wolfram production declined by 30·748 tons compared with the output for the previous year. The main producers again were Storey's Creek and Aberfoyle Mines. No new finds of note were recorded during the year. Production was 211·1268 tons wolfram valued at £69,890·83 sterling.

Storey's Creek Mine.—Reviewed under "Tin," produced 148·3 tons wolfram, with a content of 107·2 tons tungstic trioxide, valued at £49,615 sterling.

Aberfoyle Mine.—Reviewed under "Tin," produced 60·3049 tons wolfram, with a content of 42·7723 tons tungstic trioxide, valued at £19,610·42 sterling.

Waverley Mine.—Produced one parcel of mixed concentrates which had a wolfram content of 0·1040 ton, containing 0·059 ton tungstic trioxide, valued at £26·82 sterling. Other production is shown under "Tin" and "Bismuth."

Miscellaneous, Storey's Creek and Avoca.—One parcel of 0·2009 ton wolfram concentrate containing 0·1416 ton tungstic trioxide, valued at £63·72 sterling, was obtained from small mines in this district.

F. G. Townsend, Moina.—From alluvial workings, a mixed concentrate of wolfram, tin and bismuth was obtained. Wolfram production amounted to a concentrate containing 0·8893 ton tungstic trioxide, valued at £303·08.

Knight and Bloomfield, Mt. Pelion.—This party carried out operations in the early part of the year, but, owing to difficulties of transport and ill-health of one of the partners, work has been abandoned. Production amounted to 0·6353 ton concentrate, the tungstic trioxide content being 0·4101 ton, value £205·05 sterling.

Shepherd and Murphy Mine.—Wolfram production was 0·1669 ton concentrate, containing 0·0932 ton tungstic trioxide, valued at £41·94 sterling. This mine produces a variety of minerals and is dealt with more fully under "Tin."

GOLD.

Gold production was nearly double that of the previous year, the production being 703·058 fine ozs. valued at £6012·28 sterling. The increase in production was largely due to the Dorset Dredge, a new producer which obtains a considerable amount of gold along with the tin in the alluvial wash being treated. Gold prospecting was not particularly active during the year due mainly to wartime conditions.

Golden Gate Dumps, Mathinna.—This plant was closed down for approximately half of the year while intensive reconstruction work was carried out to increase the tonnage treated and for more economical working. A system was installed for sluicing of the old tailings to a central pump for elevation to the treatment plant. The reconstructed plant came into operation during the last quarter of the year and production amounted to 422·937 fine oz., valued at £3611·03 sterling, from the retreatment of 5343 tons of accumulated tailings. Employment was given to 7 men.

Eastern Leads, Bradshaws Creek.—Reviewed under "Tin," recovered alluvial gold containing 4·308 fine oz., valued at £36·19 sterling.

Dorset Dredge.—A quantity of alluvial gold was extracted from the tin-oxide recovered by dredging and returned 252·958 fine oz., valued at £2168·63 sterling.

Endurance Mine.—Alluvial gold, extracted from the tin concentrates recovered from sluicing operations contained 6·893 fine oz., valued at £59·35 sterling.

Austin Friars Pty. Ltd., Beaconsfield.—This company carried out the erection of plant for the re-treatment of old tailings at Middle Arm. However, with the death of Mr. Mathews, an interested party, work was suspended during the latter part of the year. 577 tons of tailings were re-treated by the cyanide process for the recovery of 5·696 fine oz., valued at £48·88 sterling, average number of men employed for the year 2.

Miscellaneous.—Other gold production for the year came from small producers at Mangana, Gladstone, Lefroy, Nabowla and Lisle. In these fields an average of 8 men was engaged on production and prospecting. Gold recovered contained 10·266 fine oz., valued at £88 sterling.

BISMUTH.

Production for the year amounted to 0·532 ton metallic bismuth, valued at £375·93 sterling, most of the production coming from the Moina area.

Shepherd and Murphy Mine.—Production was 0·9504 ton concentrate, containing 0·5138 ton bismuth, valued at £363·19 sterling. Operations are reviewed under "Tin."

F. G. Townsend, Moina.—Mentioned under "Tin" and "Wolfram," produced concentrate containing 0·0097 ton bismuth, valued at £6·79 sterling.

Waverley Mine, Weldborough.—This mine produced a parcel of mixed concentrates, the bismuth content being 0·0085 ton, valued at £5·95 sterling.

LIMESTONE.

The output of limestone was 50,509 tons, the major portion of which was shipped out of the State for flux in iron smelting, the remainder being used for the manufacture of lime and agricultural purposes.

Broken Hill Pty., Melrose.—This company operated its quarries at Melrose on a reduced scale due to shortage of labour and industrial troubles at the iron and steel works in New South Wales. The average employment for the year was 42 compared with 71 for the previous year. Production amounted to 46,910 tons limestone, valued at £24,350 Australian currency.

Melrose Agricultural Lime Works.—These works continued the grinding of waste screenings from B.H.P. quarries for the manufacture of Agricultural limestone. Production amounted to 2279 tons valued at £1707. Employment was given to 5 men.

Railton Lime Works.—These works carried on during the year on a limited scale to produce burnt lime. During the latter half of the year, limestone was obtained from the Goliath Portland Cement Works and direct quarrying was discontinued. During the period of quarrying the production obtained was 1082 tons limestone, valued at £265 5s. Australian. Three men were employed at the works.

J. R. Dally, Flowery Gully.—Employment was given to two men at these works in burning lime in two old type lime kilns. Production at the quarry was 238 tons of limestone, valued at £59 10s. Australian.

CEMENT.

Goliath Portland Cement Co., Railton.—The company continued to operate throughout the year. Their progressive policy was apparent at the end of the year when preliminary work was carried out on a housing scheme for employees, and also work on a factory site for the production of Asbestos cement building sheets. Extra storage bins were constructed at present works to cope with orders for special cements. Production from quarries was 57,340 tons of limestone and 978 tons ironstone for use in cement manufacture. Ninety-eight men were employed.

CLAY.

There was a considerable increase in the quantity of clay mined for various purposes.

Endurance Clay Deposit, South Mt. Cameron.—A. Pearson operated a clay pit at the Endurance Mine to obtain clay for use at the Associated Pulp and Paper Mills, Burnie. Work commenced at the pit early in the year and employment was given to an average of 5 men, production amounting to 2739·5 tons clay, valued at £6862 15s. Australian currency. The clay was reported to be of good quality and free from grit.

Relbia Clay Pit.—A. Pearson operated this pit for a short period to produce 36·5 tons of clay, valued at £41 2s. 6d. Australian currency. The clay was shipped to the mainland. Operations afforded employment for 3 men during the production period.

Haines Brick Works, Dulverton.—These works operated during the year, giving employment to 7 men and using 820 tons of clay in the manufacture of bricks.

Inspector D. Besford, Hobart, reports:—

Employment.

The average number of persons directly employed in coal mines, quarries, and works was 2153 compared with 2160 for the previous year. The distribution was as follows:—

Coal Mines	279
Limestone Quarries	40
Quarries and Brickworks	96
Osmiridium and Tin Mines	13
Works	1725
Total	2153

Accidents.

It is gratifying to record that no fatal accidents occurred during the year, and that of fifteen persons involved in accidents which caused incapacitation for at least fourteen working days, none proved to be of a dangerous character, and all workmen have since returned to work.

Nine accidents were associated with surface operations and six occurred underground. Two accidents were due to falls of rock.

The most serious accident was caused by a spark of molten material igniting a workman's bag apron, which in turn, set light to his clothing and caused extensive burns to the face, arms, and legs.

Another workman received a badly fractured ankle, when his foot was caught between the movable blade of a set of points and the fixed rail. This person ran in front of a moving loaded truck in order to change the points, and observed that the points had been inadvertently left open, but was unable to prevent the wheels of the truck striking the blade and forcing it against the fixed rail, and jammed his foot which was between the rails.

All other accidents were less serious, and were generally the result of simple causes.

Safety.

Attention has again been directed to the safe working of mines, works and quarries, including the maintenance of healthy conditions of employment. There have been cases when it has been considered necessary to insist on works being carried out by the management in order to insure greater protection of employees, but mines and works have generally been maintained in a safe condition. It has also been necessary at times to insist that the workmen take steps to protect themselves from possible injury. The most common form of neglect by workmen, was to delay the setting of roof supports at the face of the underground workings. Workmen are prone to judge the condition of the roof by a visual examination which is not a reliable indication, and the large areas of unsupported roof at the face should be avoided.

The quality of the timber supplied has generally been satisfactory, and a sufficient quantity has, in most cases, been within easy reach of the workmen, but some cases were observed where delivery was delayed, and should not occur, as it encourages miners to take risks which ought not be taken.

The extraction of pillars continued at one mine, and it is pleasing to report that no serious accident occurred in this section of the mine. It has been difficult to maintain sufficient height in the roadways due to excessive floor heave, and when it has been necessary to insist on more height to allow horses and men to pass along the roadway without touching the roof, or timber, the work has been carried out promptly.

Arc-wall coal-cutting machines and hand-held boring machines were introduced into another mine. It was necessary to make several inspections in order to see that the equipment was installed in accordance with safe standards. Some of the cables supplied were not regarded as suitable, as they did not comply with the recognised standards for Coal Mining Electrical Equipment, and were rejected. The cables were replaced with new ones of the required standards. It was also necessary to test the new Gate-end Boxes and surface installation, as well as the underground cables. These were found satisfactory. The regular testing of electrical safeguards has been carried out at each periodical inspection, and this has ensured that the equipment has been maintained in a satisfactory condition, for the protection of operators in the event of electrical breakdowns.

Attention has also been directed to the efficient ventilation of the underground working places, and also to the use of water around the various works, in order that there should be no danger of dust exposure. Occasionally it has been necessary to insist on works being carried out, or precautions taken, to reduce the amount of dust, or exposure to dusty atmospheres. Where coal-cutting machines operate underground, the velocity of air has been checked regularly to ensure that a sufficient velocity is maintained at the face to carry away any dust produced when the machine operates.

It was considered necessary in one case, to order the use of water to guard against the possibility of igniting coal dust when blasting in the mine. This precaution is especially necessary where several shots are fired simultaneously, as a cloud of dust raised when firing the first round, might be ignited when firing the second or any subsequent round of shots.

Misfired shots were investigated whenever these were reported, and tests were carried out on the recovered detonators. Electrical misfires were mostly due to faulty cables or apparatus. Replacement of the faulty equipment was ordered, and resulted in the elimination of electrical misfires. Galvanometers were ordered to be supplied, and used for the testing of detonators, to ensure that detonators with good electrical circuit be sent into the mine.

It was found necessary to forbid the use of some trailing cables which were considered unsafe, while in other cases, precautions were ordered to ensure safer conditions for those handling the trailing cables. One trailing cable was

fitted with an additional covering as a temporary precaution, to allow the cable to be safely handled, until a new trailing cable could be delivered. In another case additional safeguards were required to be used until new cables could be procured. In both cases, the cables were regularly tested to see that they could be handled with safety.

All mines were regularly tested with the safety lamp for inflammable gas, and no gas was found.

Complaints were received and investigated in connection with blasting at some of the quarries in the Hobart area, and suggestions were made to minimise the possibility of pieces of stone flying outside the quarry area. It was found that the worst offenders were small breaking-up shots. These shotholes are generally of shallow depth and pieces of stone can be projected great distances unless care is exercised in charging, and covering the hole with suitable covering. Owners should make every endeavour to see that all precautions are taken to prevent stones flying outside the quarry area.

Complaints were also received and investigated in connection with metallurgical works, and recommendations made for improving conditions when it was found that the conditions could be improved. Recommendations were adopted and put into effect without much delay.

Quarries were regularly inspected. In some cases it was found that the face was too steep, and instructions were issued for work to be carried out to remedy the condition. In some instances men had to be withdrawn from sections of the face which were considered in a dangerous condition. The overburden at several quarries requires frequent inspection, as it is fairly thick in some cases, and sometimes of a friable nature, requiring frequent removal. Particular attention was paid to ledges where loose stones collect, and require to be frequently cleaned away as they are a definite danger to workmen at the bottom of the face.

Ventilation.

No inflammable gas was detected at any of the mines, and only isolated cases of blackdamp were found in the mines in the North West. These latter mines are small, and have relied upon natural ventilation, but the installation of main fans should ensure better ventilation.

Difficulty was experienced in ventilating some of the workings in the Pillar Section at one mine, as old roads were blocked by floor heave. The opening up of suitable airways, entailed a great deal of difficulty and expense. Several places were found to be insufficiently ventilated, and it was necessary to withdraw the workmen until more satisfactory conditions could be established. It was also necessary to insist on the erection of brattice to conduct the air into the face, to ensure that healthy conditions were obtained.

Wet and dry bulb temperature have been taken regularly, and the air currents have been regularly measured to see that the requirements of the Act were fulfilled. In most cases the quality of air was found to be satisfactory. Temperature were observed to be well within the limits laid down by the Mines and Works Regulation Act, the average reading being less than sixty degrees Fahrenheit, with a difference of at least two degrees between the wet and dry bulb readings. The maximum temperatures recorded were 70° Fahrenheit on the dry bulb, and 68° Fahrenheit wet bulb, whilst the minimum temperatures recorded were 47° Fahrenheit dry bulb, and 45° Fahrenheit wet bulb.

Machinery.

Machinery was examined regularly, and was generally found in good condition. Regular inspections and tests were carried out to see that the insulation resistance of the electrical apparatus and cables was maintained at the required minimum standard, and where the resistance fell below the standard, remedial measures were ordered, as it is necessary to arrest all leakages before they develop into a more serious condition, which might result in an underground fire, and also to prevent a possible total breakdown of the insulation, resulting in probable electric shock. Earth Leakage Protection units were regularly tested, and at times these were found faulty. The machines protected by these units were immediately stopped, and were not allowed to be used until the fault was rectified, and the units operated satisfactorily. In one case it was found that the Earth Leakage would not operate, and an examination of the earth circuit disclosed that the earth continuity was broken by some person, who had removed the connector. The severing of this connection might have had serious consequences if a fault had developed in the machine, as it would have prevented the operation of the Earth Leakage Protection. The open circuit also points to the necessity of regularly examining the earth circuits to see that they are continuous. It was necessary to test the new electrical installation at one coal mine, where new machinery was installed underground. The installation was carried out in a satisfactory manner, and complied with good standard practice. The cables were examined and tested, and some were found below the required standard for underground work. These had to be replaced before the installation could be passed. Temporary precautions were imposed to allow the machines to operate safely until some of the equipment was delivered. Delivery of equipment had been delayed by transport difficulties. These temporary measures were lifted when the apparatus was delivered and installed. The establishment of rules relating to the use of electricity and electrical machinery in coal mines is desirable in order that managers of mines may have some guide for the installation and use of electricity, and to provide better maintenance.

Health and Sanitation.

Matters affecting health have been given due attention at the various mines and works, and remedial measures have been enforced in some cases to allay dust. The provision of crib rooms and change rooms has been carried out in some cases where these were not previously provided. Shelters have also been provided for persons exposed to the weather at the suface of the mines. Complaints were received and investigated regarding dust and fumes, and where improvements could be affected, these were carried out without delay. In one case the investigations revealed that the dusty conditions had been caused by an operating experiment, which caused excessives dust in one section of the works, and the experiment was discontinued. Normal conditions were satisfactory. It has again been found that some improvement could be obtained if the workmen paid strict attention to their obligations, in using sprays where these are provided, and also in the handling of dry material. The man-handling of rock in one large shed due to low stocks caused inconvenience, as the workmen had to work inside the shed shovelling the dry material, which is normally handled without the necessity of entering the building. It was found necessary to adopt measures to increase the flow of air through the compartment to carry away the dust. It was also found that some material which was being delivered to the works was too dry, and workmen were exposed to dusty conditions when they were engaged in unloading the trucks. Representations were made to have this material damped before loading, and when this was adopted, improved conditions resulted.

Where workmen were engaged in breaking up a manufactured product, it was considered impractical to break the material by means of crushers. The conditions were not considered satisfactory, but it was not possible to say whether the dust produced was of a dangerous character, and samples were collected for analyses and tests, to ascertain the quality. In the meantime fans were ordered to be installed to carry away any dust which might be produced. This latter provision proved unsuitable, as the draught produced by the operation of the fan rendered conditions uncomfortable for the workmen.

Explosives.

The storage of explosives has been constantly checked, and some new magazines have been constructed either to replace those considered unsuitable, or to provide for increased storage.

The number of misfired shots has been much lower during the past year due chiefly to the use of better equipment. Investigation of misfired shots at one mine proved the misfires to be caused by faulty shotfiring apparatus, and when better equipment was provided, the trouble practically disappeared. Some faulty fuseheads were found, but these may have been rendered faulty by inefficient apparatus, or wrong manipulation of the shotfiring apparatus. It was not possible to ascertain the cause, as the fuseheads may have been faulty when delivered.

Regular inspection and testing of shotfiring appliances is the best insurance against electrical misfires. Appliances were regularly examined and tested during visits of inspection to the mines.

Some mines still fire by means of fuse, and the use of proper varnish to seal the connection to the detonator, has resulted in reducing the number of misfires to a minimum. Some faulty detonators were found, but these may have been faulty when delivered.

Complaints were received regarding shotfiring at some quarries in the Hobart area, and precautionary measures were ordered to prevent stones flying when blasting, as it was suggested that flying stones might possibly cut the electricity supply wires in the vicinity of the quarry.

Representations were made for permission to allow workmen's explosives to be transported into the workings of the mine, owing to the long distance of travel into the underground working places, and a suitable explosives truck, specially constructed for the purpose, was provided. The truck is provided with separate compartments for each cannister, and is escorted into the section of the mine by an appointed person, who is responsible for the safe transport and delivery of the canisters. This innovation has resulted in the elimination of the laborious work of carrying explosives long distances underground, previously done by the miners.

Instructions and demonstrations of correct methods of electrical shotfiring have resulted in better practices, and have tended to safer use of explosives.

Inflammable Liquids.

There were no new installations during the year, and work has chiefly been of an inspectorial nature, to see that the owners of existing installations comply with the requirements of the Inflammable Liquids Act, which provides for the proper maintenance of petrol installations and depots.

General.

The Cornwall Coal Company opened up a new mine in the Fingal area, and after meeting with some difficulties, succeeded in striking a seam of average quality.

Some prospecting was carried out at Bonneys Plains, in an area which had been partially prospected, but the results so far achieved do not provide sufficient evidence to form a reliable estimate of the possibilities. Further prospecting of the area is necessary to enable a considered opinion to be expressed upon the possibilities of the area.

Investigations were made regarding the possibility of opening up an old mine at Mount Paul. An inspection was made of the old mine, and suggestions were made for unwatering an old tunnel, with a view to testing the seam.

I accompanied the Commonwealth Board of Inquiry, presided over by the Hon. Mr. Justice Davidson, a Judge of the Supreme Court of New South Wales, and assisted in the investigations of conditions in the Tasmanian coal industry.

Operations and Production.

The total output of coal was 149,077 tons valued at £125,719 at the mine bins, an average of 279 persons being employed. The corresponding figures for the previous year were 143,635 tons valued at £122,676 and 278 persons employed.

Mount Nicholas Coal Mine showed the largest increase in production, while Langloh Coal Mine at Hamilton, also showed a fairly large increase. Merrywood Coal Mine, and the Duncan Coal Mine at Fingal, came into production during the year, and accounted for nearly 3000 tons. The Jubilee Coal Mine showed the largest reduction in output, and Fingal Coal Mine also showed a reduced output, while the Cornwall Coal Mine showed a slight reduction. The overall increase in production was 5442 tons, and the output per employee was 534·3 tons against 516·6 for the previous year.

Fingal-Mount Nicholas-Dalmayne Coalfields.

The Cornwall Coal Mine continued to be the chief coal producer of the State, and produced a total of 83,253 tons, valued at £65,001 and employed an average of 127 persons. The corresponding figures for the previous year were, 83,811 tons valued at £67,339 and 131 persons employed.

Pillar extraction was on a reduced scale. This work is becoming more difficult, owing to difficulty in maintaining sufficient height in the wheeling roads for the passage of horses and transport, due to excessive floor heave. The maintenance of suitable and adequate airways through the old roads is also a problem, as all the old roads are blocked.

The Arc-wall coal-cutting machine operated in the main heading section, where the thickness of the seam was less than usual. This reduced the efficiency of both the men and the machine, and output, from this unit, was less than the previous year.

The new tunnel to the west is progressing satisfactorily, although water difficulties have been experienced. The tunnel negotiated the faulted section, and should produce coal during the coming year.

Some work was carried out in the old Blue Seam, and a small output was produced from developmental operations.

The Mount Nicholas Coal Mine was the second largest coal producer of the State, and increased production by more than 5000 tons, reaching an output of 21,790 tons, valued at £17,431, and employed 35 persons, compared with an output of 16,229 tons, valued at £13,038, and 35 persons for the previous year.

Most of the coal is produced mechanically, by means of coal-cutting machines and electric drills. The coal is loaded by means of an electric loading machine, and is hauled by an electric battery locomotive. The workings have advanced to a point approaching the economic limits of the locomotive, and consideration is being given to the introduction of some auxiliary form of haulage to assist in transporting the coal from the face to the bins. Some prospecting work has been carried out at the mine, to test the possibilities of other seams in the area.

The Jubilee Coal Mine showed a further reduction in output, and produced 14,166 tons of coal, valued at £13,061, and employed an average of 37 persons. The corresponding figures for the previous year were 18,125 tons, valued at £16,660, and 45 persons employed. About 1300 tons of coal was lost as the result of mechanical breakdowns, while absenteeism was stated to have resulted in an estimated loss of about 1400 tons, but it is difficult to estimate how much was due to avoidable absenteeism. Although the number of employees was less than that of the previous year, the output per person was also twenty tons less.

The new Arc-wall coal-cutting machine commenced operation in May, but faulty conditions in the section, retarded production from the machine. Greater benefits from the machine are possible, if more settled conditions are encountered, although much depends upon the attitude of the men towards the machine.

The workings to the right of the main tunnel are advancing towards some old workings likely to contain water, and work will have to cease before they connect. When these workings have reached the safe boundary, extraction of the pillars will be undertaken. Some old pillars have been extracted during the year, but the production from this source was small.

The transport of coal from the mine bins to the railway siding, was causing some delays, and this work was undertaken by the Transport Commission. This should result in less delays between these two points, but shortage of wagons still occurs.

Dalmayne Coal Mine, produced 2257 tons, valued at £1446, which was only a few tons less than the previous year's production. The main heading is at present standing on a large downthrow fault, and no new developmental work has been carried out to test the fault.

The Fingal Coal Mine produced 2074 tons valued at £1037 compared with 3,154 tons for the previous year. The reduced output was chiefly caused by bad development of the mine, and lack of the necessary ventilating appliances. The men had to be withdrawn from the workings to the left, as these were advanced too far, and the section was abandoned. Water difficulties in the main heading section caused delays, as no pumping machinery was available at the mine. Output from the mine is now being obtained from this section. Road transport is also difficult at this mine, owing to the bad state of the road, and this caused many delays.

Avoca Coalfield.

The Stanhope Mine produced 7822 tons valued at £8541 and employed 20 persons, the previous year's figures were, 7861 tons valued at £8863 and 20 persons employed.

No developmental work was carried out and the main heading is still standing at the old face of the longwall, which collapsed last year. All output has been obtained from the eastern side of the tunnel, by Bord and Pillar method of working, from a seam averaging about six feet thick and having a good roof and floor.

There was some prospecting work carried out at Bonneys Plains to test the continuity or otherwise of the seam, but the amount of work carried out did not enable a reliable assessment to be made of possibilities. Other prospecting work at the Bonneys Plains, consisted of opening up an old tunnel, but the amount of driving was not sufficient to determine the possibilities, and further testing was considered necessary, before any expenditure on road construction could be recommended.

Some difficulties resulted from mechanical breakdowns to the electric coal-cutting machine, and the coal had to be got by hand mining methods until the machine was repaired.

The Mount Christie Mine again increased production to 1053 tons valued at £1133, but the output appears to have reached a peak from the present tunnel, owing to very faulted conditions.

The Merrywood Coal Mine, opened up at the beginning of the year, produced 2090 tons valued at £1733 and employed an average of 5 persons.

The mine is eighteen miles from the railway siding at Avoca, and the long haulage by motor trucks caused delays, owing to breakdowns. The seam is of good thickness, and average quality and can be developed cheaply by the ordinary Bord and Pillar method as it is of easy grade, and has a good roof and floor, with very little water. The seam measures more than seventeen feet, but about seven feet is being mined.

Upper Derwent Coalfield.

The Langloh Coal Mine again increased production and reached a total of 9431 tons valued at £9431 and employed an average of 26 persons. The corresponding figures for the previous year were 6640 tons valued at £6640 and 20 persons employed.

Most of the output from this mine is obtained by the use of an Arc-wall coal-cutting machine, which cuts the bottom of the middle band of stone, measuring about two feet nine inches in thickness. This middle stone causes both loss in output, and quality, as it is difficult to extract, and there is also difficulty in preventing it from mixing with the coal. Three feet of coal is removed from the seam above this band of stone. The bottom seam averages about four feet three inches in thickness.

The Transport Commission conveys the coal by means of motor truck to the Macquarie Plains railway siding, a distance of more than sixteen miles by road. Bathrooms were erected at the mine, and these are used by all workmen.

Difficulty was experienced during the year owing to the lack of sufficient power to drive the coal-cutting machine, but necessary works were carried out, and improved the position.

This mine was inspected by the Board of Inquiry, presided over by the Hon. Mr. Justice C. G. W. Davidson, a Judge of the Supreme Court of New South Wales, and the Board favourably commented on the conditions prevailing in the mine. His Honour being particularly impressed with the tidy appearance of the underground workings.

York Plains Coalfield.

York Plains Coal Mine produced 797 tons of coal valued at £1205, and employed three men. The method of working this two feet six inch seam of semi-anthracite coal, is by longwall. Sufficient material being available from the middle band of stone, and the top following stone, to build adequate packwalls for the support of the roof, but the lowering of the roof creates very low conditions in the roadways. An inflow of water caused much trouble, as no pumping plant was available at the mine and no electric power is available in the district.

Sandfly-Cygnet Coalfield.

Sandfly Coal Mine produced 527 tons of semi-anthracite coal for use in hop drying. Hand-mining methods are adopted, and the system is bord and pillar. Faulting has created difficulties, as faults have thrown the seam down, and the normal dip of the seam is great. The excessive dip caused water difficulties in the working places, and haulage was also difficult from the very steep tunnel.

The Mersey Coalfield.

The output from this field was 2959 tons valued at £4265, and an average of 11 persons was employed, compared with 3267 tons valued at £4392 and 10 persons for the previous year.

The Illamatha Coal Mine produced the major portion of the output from this field, production being 1651 tons. The Aberdeen Coal Mine produced 787 tons and the Tarleton Mine produced 521 tons.

All mines continue to operate on a modified longwall system, in a very thin seam of good quality coal. The seam at the Illamatha Mine averaged about two feet thick. At the Aberdeen Colliery the seam ranged about eighteen inches, whilst at Tarleton Colliery it was slightly less.

The output from the Illamatha Mine was reduced owing to the men being engaged on sinking another shaft for ventilation, but improved conditions arising from the connection, should result in increased production.

The coal from this field is of good quality, and the Ovaltine Factory at Quioba uses the whole of the output. The high sulphur content of the coal has not caused any troubles, and when the coal is mixed with coals from the East coast it makes a suitable fuel for use in the boilers.

Carbide, Limestone and Silica.

Limestone was quarried at Ida Bay, Junee, and Granton. Junee quarry operated for the first quarter only and has since remained idle.

The production of limestone was 18,999 tons, valued at £23,633, an average of 49 persons being employed in production. The corresponding figures for the previous year were 31,955 tons, valued at £33,690, and 47 persons employed. This shows a large reduction in the output of limestone, which is accounted for by the large reduction in carbide production, and also to the reduced amount delivered to the Electrolytic Zinc Company at Risdon. Most of the limestone is used in the manufacture of carbide. Approximately 15,500 tons was supplied to the Carbide Company at Electrona, compared with 23,000 tons for the previous year. The new process introduced at the Zinc works, reduced the amount from 7000 tons for the previous year, to about 1300 tons for year under review.

Granton lime works produced 2231 tons of lime for building purposes and spil treatment.

Silica production increased to 3739 tons valued at £4120 and employed 4 persons. The silica was used for the production of Ferro-silicon and Calcium Silicide.

The Australian Commonwealth Carbide Company produced 5686 tons of carbide, valued at £136,464, and employed an average of 143 persons on production; the corresponding figures for the previous year were, 10,632 tons of carbide, valued at £233,488, and 161 persons.

Ferro-silicon production was commenced during the year, and reached a total of 1314 tons valued at £50,580, upon which 31 persons were employed. This Ferro-silicon is of a high grade, chiefly about seventy-five per cent, and is used in connection with steel production by the Broken Hill Pty. Coy. Ltd.

In addition to the above products, 64·5 tons of Calcium Silicide was produced, valued at £7224.

Ore Treatment.

The Electrolytic Zinc Company treated 168,453 tons of Calcines, and recovered 83,773 tons of slab zinc, valued at £1,926,779, compared with 144,750 tons of calcines treated for the recovery of 78,204 tons of zinc, valued at £1,885,855 for the previous year. In addition, 229·07 tons of Cadmium was recovered, valued at £102,624; and 13·68 tons of Cobalt Oxide valued at £6291. Approximately 38,000 tons of Superphosphate was produced, at the Risdon Works, but shortage of transport limited the sales to about 35,000 tons. The change over to the continuous leaching process of treatment, resulted in greater efficiency, and also improved conditions at certain parts of the works. This improvement was especially noticable in the tramming floor section, where dusty conditions had been the cause of complaints previously. Faulty operation of the acid plant caused trouble, but when the fault was located and rectified, conditions improved, and the efficiency of the plant was restored. An average of 1555 persons was employed at the Risdon Works compared with 1591 for the previous year.

Tin.

Metallic tin in tin-oxide recovered from the alluvial workings at Cox Bight was 3·965 tons, valued at £1187 compared with 3·6 tons valued at £1078 for the previous year.

Osmiridium.

The production of Osmiridium again showed an increase, the production being 103·633 oz. valued at £2539, compared with a production of 94 oz. valued at £2323 for the previous year.

Kaolin.

Operations at Surges Bay were restarted during the year, and the output of Kaolin was 260·5 tons valued at £1132. An average of 4 men was employed.

APPENDIX VI.

REPORT OF THE MOUNT CAMERON WATER-RACE BOARD FOR THE YEAR ENDING 31ST DECEMBER, 1945.

SIR,

We have the honour to submit the report of the Mount Cameron Water Race Board for the year ended the 31st December, 1945.

Production of tin-oxide from all activities, serviced by the race, was 15·8031 tons, as compared with 22·1728 tons for the previous year. The output under royalty scale improved by 1·1835 tons but there was a decline of 7·5995 tons under the fixed scale of payment for water.

Productive operations, under fixed scale, were unbalanced by reconstructional work, preceding a change over from steam to electric power at the principal mine, and it is expected that the output will improve next financial year.

Revenue was £31 0s. 8d. more than for the previous year but there was an increase of £107 14s. 7d. in expenditure, and there was a net loss of £212 6s. 8d. in the working of the race system. There was an expediture of £225 3s. 11d., from a special appropriation, on scrubbing and clearing the main race, and this made the aggregate operating deficit £437 10s. 7d.

During the past five years, the output of tin-oxide has consistently declined from 36·2875 to 15·8031 tons and the financial position has altered from one of profitable working to one of an increasing deficit. There has been no improvement in the average number of claims supplied with water and the average number of men employed has reduced to ten. A large expenditure of money will be necessary if ageing units of the race system are to be conditioned or replaced for useful service, and, in the absence of a forward development in productive mining, there are no prospects of balanced economics if expenditure on captial works is to be regarded as operating costs. Members of the Board have been conscious of the rapid deterioration in production and financial outlook, but have agreed that the incurrence of a reasonable deficit has been merited in the preservation of the race, as it services a small mining community, contributes to the stability of the Gladstone township, and may become a source of post-war employment. An extension of the transmission line of the Hydro-Electric Commission to Gladstone and mining developments in the immediate post-war years will determine the ultimate economics of the race system and the merits of continuing to meet operational liabilities by special appropriations by the Government.

Races.—An expenditure of £225 3s. 11d. was incurred in scrubbing and clearing the main races. Subsidiary races have been cleared and scrubbed and the general condition of races has been much improved.

Syphons.—The proposed replacement of the main metal syphon with a 27-inch internal diameter flexible concrete syphon was proceeded with and replacement will be completed in the coming year.

The flexible concrete section of the Ringarooma syphon has given excellent service, but the wood-stave section has continued to cause much concern and the future usefulness of this syphon is now one of uncertainty. The merits and cost of replacement are being investigated.

Other syphons have been maintained in serviceable condition.

Flumings.—Flumings have been maintained in good order but early conditioning of the section at Blackaby's dam will be necessary and will be undertaken in the coming year.

Dams.—All dams were maintained in serviceable condition. The intake weir of the main race, at the Great Mussel Roe River, has been held in serviceable condition pending the availability of suitable labour for its replacement.

Buildings.—Necessary repairs were carried out at cottages occupied by employees but some improvements are desirable in living amenities and these have been scheduled for attention.

General.—A noteworthy feature in the development of the district was the extension of the electric transmission line of the Hydro-Electric Commission to Gladstone. The availability of electric power now affords an opportunity to mining interests to consider mining possibilities in localities outside the compass of gravitational sluicing, to augment activities where insufficient water is normally available from the race system and to relieve the extravagant use of race water in the operation of hydro-elevators so that a wider distribution of water may be made for normal sluicing. The third factor is of importance to the Board and is one that will be given due consideration in any forward programme of developmental activities.

Personnel.—After several years of commendable service on the Board of Management Mr. George Mallinson resigned as a Member and, following nomination by a meeting of users of race water, Mr. Vivian Charles Daw, was duly appointed in his stead.

We have the honour to be,

Sir,

Your obedient servants,

W. H. WILLIAMS, Chairman of the Board.

CECIL G. RYAN,
V. C. DAWE, } Members.

The Hon. the Minister for Mines, Hobart.

STATEMENT FOR THE YEAR ENDED 31ST DECEMBER, 1945.

Rainfall.

The registered rainfall for the year was as follows:—

Great Mussel Roe .... 37 inches 80 points.
Little Mussel Roe .... 37 inches 57 points.

Revenue.

The revenue for the year from sale of water amounted to £789 15s. 6d. being an increase of £31 0s. 8d. against that of the previous year.

Disbursements.

The Net Expenditure for the year amounted to £1,002 12s. 2d. being an increase of £107 14s. 7d. against that of the previous year.

Statistics.

The statistics for the year are as follows:—

Average number of claims supplied per week				5
Greatest number supplied in any one week				8
Total number of heads supplied under:—				
Fixed or cash scale				173·3
Royalty or credit scale				1954
Tin ore raised—	tons.	cwt.	qr.	lb.
Under royalty scale	15	15	0	15
Under fixed scale	0	0	3	20
	15	16	0	7

Average number of men employed per week—10.

Statement of Receipts and Payments of the Mount Cameron Water-race Suspense Account for the Year ended 31st December, 1945

Receipts.	£	s.	d.
Water sold under fixed scale	51	12	0
Water sold under royalty scale	714	3	6
Water sold for domestic purposes	24	0	0
Transfer fee on contract	0	10	0
Total receipts	790	5	6
Excess payments over receipts	212	6	8
	£1,002	12	2

Payments.		£	s.	d.
Salaries and wages		871	2	6
Pay roll tax		22	14	6
Repairs to races, syphons, dams, and culverts—				
Wages	£39 5 3			
Materials, &c.	11 18 5			
		51	3	8
Widening race to H. C. Lawry's Machinery Site	£59 4 11			
Less contribution by H. C. Lawry on £ for £ basis	29 2 3			
		30	2	8
Repairs new road to intake at Main Creek		10	0	0
Travelling Expenses		1	0	0
Insurance		9	15	4
Repairs telephone		1	15	0
Printing		0	18	0
Rubber boots for staff		4	0	6
		£1,002	12	2

H. H. Pimblett, Government Printer, Tasmania.

STATE ECONOMIC PLANNING AUTHORITY
1947

MINERAL RESOURCES

Prepared from information supplied by the Geological Survey
Department of Mines

REFERENCE

LODE MINERALS:	Prospects	Mines
Asbestos	■	⊙
Baryte	▼	⊙
Copper	●	⊙
Gold	●	⊙
Iron	●	◉
Molybdenum	■	⊙
Nickel	●	⊙
Osmiridium	■	⊙
Silver-Lead	■	◉
Tin	●	⊙
Tungsten	■	⊙
Zinc-Lead	▲	◉

Red Granite

Genetically related prospects are grouped by broken lines in the appropriate colour

STRATIFIED AND RESIDUAL DEPOSITS:	Mines
Coal	⊙
Oil Shale	⊙
Bauxite	
Limestone	○ Quarry
Dolomite	
ALLUVIAL DEPOSITS:	
Gold	○
Tin	○
Osmiridium	○
Titaniferous Sands	

Non Operating or Abandoned Mines ◇

5 cm

NOTE.—

This map has been prepared from the most reliable information available at the time of publication and is subject to modification when detailed surveys and investigations are carried out.

TASMANIA

Scale 16 miles to 1 inch.

Drawn and reproduced by the Department of Lands and Surveys, Mapping Branch, Hobart.

MERCURY OFFSET

STATE ECONOMIC PLANNING AUTHORITY
1947

SKETCH MAP OF GEOLOGY

Prepared from information supplied by the Geological Survey
Department of Mines

REFERENCE

STRATIFIED ROCKS

- TERTIARY & RECENT
- TERTIARY BASALT
- TRIASSIC
- PERMIAN
- UPPER SILURIAN
- SILURIAN?
- ORDOVICIAN—SILURIAN LIMESTONES
- LOWER ORDOVICIAN (Tremadocian)
- CAMBRIAN
- CAMBRIAN DOLOMITE
- UPPER PRE-CAMBRIAN

INTRUSIVE ROCKS

- SERPENTINE, GABBRO Etc. (Palaeozoic)
- DOLERITE (Jurassic)
- ALKALINE SYENITES ETC. (Upper Mesozoic or Lower Tertiary)
- GRANITE (Palaeozoic)

NOTE.—

1. Contour interval 1000′ with 2000′ line accentuated and 4000′ line heavily accentuated. 500′ line is interpolated in broken lines.
2. Area on King Island shown as Cambrian includes tillite considered coeval with Sturtian tillite of South Australia now regarded as Eo Cambrian or late Pre-Cambrian

5 cm

NOTE.
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TASMANIA

Scale 16 miles to 1 inch.

8 4 0 8 16 24 32

MERCURY OFFSET

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