special cars to various superphosphate manufacturers in South Australia for the manufacture of superphosphate.

80. To what part of South Australia is it delivered?—It mostly goes to Port Adelaide, but some of it goes to Wallaroo.

81. What type of acid plant have you at the works?—It is what is known as a contact acid plant.

82. What is the strength of the acid produced by it?—Roughly, 100 per cent. sulphuric acid. It varies a little.

83. Are there other types of acid plants?—Yes; the commonest is what is ordinarily known as the chamber process.

84. What strength of acid does that produce?—Acid of about 60 per cent. sulphuric acid.

85. The contact acid has a number of special uses, particularly in wartime?—Yes. It is essential to have concentrated acids for certain munition work.

86. So that in case of necessity for the defence of Australia this acid could be railed to any portion of Australia in connection with the production of munitions?—Yes.

87. Therefore, to that extent this plant may be regarded as a definite contribution to the defence question in Australia?—It would certainly be useful in that connection if ever required.

88. How many furnaces have you in the zinc roasting plant?—That plant carries two different types of furnaces. It has two furnaces known as Skinner furnaces, and six which are built on the De Spirlet principle, and are known here as Barrier roaster type furnaces.

89. Is the tonnage treated in the Skinner plant and the Barrier roaster plant separately?—The Skinner furnaces each treat about 50 tons of zinc concenerates in 24 hours, and the Barrier roaster furnaces from 10 to 12 tons in the same period.

90. Briefly, what happens in these furnaces from the chemical standpoint?—In these furnaces, the Skinner furnaces I particularly refer to, there is a certain amount of coal used to assist in maintainng the heat necessary to oxdise the zinc sulphide to zinc oxide, and so liberate the sulphur. In the Barrier roaster furnaces the oxidation is carried on entirely by the aid of the heat furnished by the oxidation of the sulphides, that is to say, there is no extraneous fuel used in these latter furnaces. In the furnaces themselves are really a series of hearths, superimposed one upon the other. In the case of the Skinner furnaces these hearths are fixed, and the ore is moved from one hearth to the other by means of rabbles, which push it along until it ultimately comes to a discharge vent, which allows the ore to drop on to the hearth immediately beneath. The operation is repeated there by another set of rabbles, and so on until the ore finally reaches the bottom of the furnace, by which time the major part of its sulphur has been eliminated. In the Barrier roaster type furnaces every alternate hearth revolves, and the ore is moved on each hearth gradually towards a discharge opening by means of rabbling blades that are set in the hearths themselves.

91. Prior to the war the zinc concentrates from Broken Hill were practically all treated in Europe?—Yes. A small tonnage was used out here for the production of spelter by the ordinary distillation process.

92. When you say Europe what do you mean?—Mostly on the Continent.

93. Owing to the development in the demand for zinc during the war it was discovered that the British Empire was very short of internal production of zinc?—Yes. It was not producing nearly enough for its own requirements.

94. Was that the reason for the development of this industry in Australia?—It was the reason for the development of the industry that arose in Tasmania, in which connection this roasting is carried on.

95. The roasting in Europe of the zinc concentrates from Broken Hill was carried on mostly by hand labor?—I cannot say definitely.

96. When the roasting plants were erected here they were originally to a considerable extent experimental?—The original Barrier roaster type furnaces and the Skinner furnaces were to a certain extent experimental. Particularly was this so in regard to the Barrier roaster type furnaces.

97. Is there another type used in South Australia besides these two types?—Yes. At Port Adelaide Herreshoff furnaces are used for the same purpose that we use the Skinner and the Barrier roaster types.

98. Has the utilisation of all these furnaces for this particular purpose been worked out in Australia in its application to Broken Hill concentrates?—Yes.

99. And still further improvements are being made in the roasting work?—The Barrier roaster type furnaces are very greatly improved over those that were originally erected at Broken Hill.

100. In addition to the plant you have described, you have, of course, the ordinary shops and offices connected with any big industrial establishment?—We have the usual service offices throughout the plant.

101. Can you say how many men are employed at the works?—The number varies slightly from day to day, but it is between 1,600 and 1,700.

102. Can you supply any statements showing details in regard to the men employed?—Yes. I hand in a statement showing the number of daily paid men employed at the smelters in the different departments on April 24th, 1925. It reads as follows:—Refinery, 271; top floor, 78; bottom floor, 129; Dwight & Lloyd, 132; Huntington-Heberlein, 48; heap sintering, 18; ore discharging, 17; slag pit, 62; Skinner and Barrier roasting furnaces, 54; acid plant, 28; service, 830; total, 1,667.

103. What do you mean by the service department?—Those employees that are not definitely connected with any one regular operating department engaged in the actual treatment of the ore, such as the workshops, power house, the yard gangs generally, and the wharf gangs.

104. I find I have missed one operation in asking you for a description of the plant generally. You mention here heap sintering. What is that?—Heap sintering is a process that will be eliminated from our operations about August this year. The material treated in this way is the residue that remained after the treatment of the zinc ores in the zinc distillation plant that used to operate at Port Pirie. These residues carry small amounts of lead and silver, and it is with the object of recovering these metals that the heap sintering process is carried on. In effect it is very like the Huntington-Heberlein process carried on in heaps in the open air, as against the sintering in a special pot. The material is laid down over small brick flues that are set on the surface of the ground. Before it is laid down a certain amount of kindling wood is laid along these flues and when this is covered it is ignited, and a gentle blast turned on into the flues. From these flues, which are simply made of loose brick work, the air is delivered out practically all over the bottom of the ore heap, and the coke which the residues contain becomes ignited, and under the influence of the blast partially smelts the material of the residues, sintering them together and putting them into such a form that they are suitable for blast furnace reduction after having been broken up.

105. I presume that if the Commission desire any further information in regard to table A it can be supplied from your records?—Yes, at any time.

106. *By the Chairman*—With regard to the 1,667 men shown to have been employed on this particular day, I presume that the number varies considerably from day to day?—Yes, that is why we had to take one specific day, and why I mentioned that the number varied between 1,600 and 1,700 men.

107. Have you any idea of the total number of men from whom your employees are drawn. Would it amount to 2,000?—I propose to put in a labor turnover table which will give you the information you desire. I cannot say definitely what number of men are available for work in Port Pirie. At times we are short, and sometimes we have an overplus.

108. *By Mr. Robinette*—Has there been any excess during the last 18 months?—Yes. There have been 30 or 40 men outside the gate nearly every shift for some months past. They have mostly been foreigners.

109. *By Mr. Pearson*—What is the lead content of the

material treated by heap sintering?—The lead content varies. It can be taken as around 8 per cent. to 10 per cent.

110. *By Mr. Gepp*—You have an exhibit, table B, showing the labor turnover?—Yes. It is as follows:—

TABLE "B."—LABOR TURNOVER.

Nationalities and Numbers of Individuals Employed during each Half-year for the Period 23/6/19 to 31/12/24

Half-year Ended	Nationalities.																
	British.		Total Foreigners.		Greek.		Maltese.		Italian.		German.		Scandinavian.		Russian.		Other.		Total.
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	
23/12/19	2,019	83·706	393	16·294	124	5·140	56	2·322	35	1·451	54	2·239	49	2·032	47	1·949	28	1·161	2,412
23/6/20	1,256	88·763	159	11·237	33	2·332	4	0·283	12	0·848	42	2·969	27	1·908	32	2·261	9	0·636	1,415
22/12/20	1,167	89·631	135	10·369	27	2·074	3	0·230	13	0·998	41	3·149	22	1·690	27	2·074	2	0·154	1,302
22/6/21	830	91·713	75	8·287	5	0·552	2	0·221	8	0·884	28	3·094	18	1·989	14	1·547	—	—	905
21/12/21	1,186	88·191	158	11·809	31	2·317	13	0·972	26	1·943	41	3·064	23	1·719	15	1·121	9	0·673	1,338
21/6/22	1,366	88·414	179	11·586	39	2·524	21	1·359	35	2·266	36	2·331	24	1·553	14	0·906	10	0·647	1,545
20/12/22	1,471	84·250	275	15·750	61	3·494	47	2·692	72	4·124	34	1·947	21	1·203	17	0·973	23	1·317	1,746
20/6/23	1,819	78·813	489	21·187	117	5·069	110	4·766	138	5·979	35	1·517	24	1·040	25	1·083	40	1·733	2,308
19/12/23	1,714	77·451	499	22·549	207	9·354	95	4·293	76	3·434	32	1·446	37	1·672	24	1·085	28	1·265	2,213
2/7/24	1,853	72·610	699	27·390	336	13·166	137	5·369	100	3·918	33	1·293	40	1·567	25	0·980	28	1·097	2,552
31/12/24	1,761	67·342	854	32·658	465	17·782	96	3·671	144	5·507	24	0·918	54	2·065	29	1·109	42	1·606	2,615

It will be noted that the foreigners are divided into various sections. This return would include a man employed at the works on only one day. As long as he became an employee of the works during a half-year he would be included. The table shows that for the half-year ended 23-12-19 the labor turnover in Britishers alone was 2,019 men, representing 83.706 of the total labor turnover. The total foreigners numbered 393, and they represented 16.294 per cent. of the total labor turnover for that period. Of those 393 foreigners, 124 were Greeks, representing 5.140 per cent. of the total labor turnover; 56 were Maltese, representing 2.322 per cent.; 35 were Italians, representing 1.451 per cent.; 54 were Germans, representing 2.239 per cent.; 49 were Scandinavians, representing 2.032 per cent.; 47 were Russians, representing 1.949 per cent.; and 28 were various nationalities not otherwise enumerated, representing 1.161 per cent.; the complete total being 2,412 men.

111. Will you give us the period when your percentage of British-born labor was the lowest?—In the half-year ended 31/12/24 the total labor turnover was 2,615 men. Of that number, 1,761, equal to 67.342 per cent., were British; and 854, equal to 32.658 per cent., were foreigners. Of those foreigners, 465, equal to 17.782 per cent., were Greeks; 96, equal to 3.671 per cent., were Maltese; 144, equal to 5.507 per cent., were Italians; 24, equal to 0.918 per cent., were Germans; 54, equal to 2.065 per cent., were Scandinavians; 29, equal to 1.109 per cent., were Russians; and 42, equal to 1.606 per cent., were various nationalities not elsewhere enumerated.

112. What was the reason for the very large increase in foreign labor between those two periods, particularly Greeks and Italians?—It has been due to the fact that British labor has not been available, and the only source of labor supply was the foreign element. That has been the position for some considerable time past.

113. Has the company at any time ever organised any importation of Southern European labor for Port Pirie?—No, decidedly not.

114. *By Mr. Robinette*—During 1919 were not the works shut down?—Yes.

115. That would affect the position, so that the figures would not be a true reflex of the position?—Those in the first line of the table might not be.

116. Would not the shut-down in 1919 reduce the percentage of foreigners?—It would considerably. We were shut down for about half of 1919.

117. Due to what cause?—The Broken Hill strike and the cessation of ore supplies.

118. *By Mr. Gepp*—With regard to the period of low labor turnover, marked "22/6/21," I take it that the smelters must have been closed for a part of that period?—They were closed during that time owing to a fire in the Dwight & Lloyd plant, which occurred early in 1921.

119. *By Mr. Robinette*—You said there was a shortage of British labor. Can you give any reason for that?—No, except that I understand South Australia is particularly prosperous at the present time, and there is very little unemployment anywhere.

120. *By Mr. Gepp*—You have another table showing segregation into nationalities of the labor turnover for the fortnight ended 11/3/25?—Yes. It is as follows:—

TABLE B1.

Nationality.	Number.	Percentage.
British	1,320	66.97
Greek	362	18.37
Italian	104	5.28
Maltese	68	3.45
Scandinavian	47	2.39
Russians	20	1.01
Germans	18	0.91
Others.	32	1.62
Total.	1,971	100.00

121. Is there any difference between Table B and Table B1?—The latter is for a very recent fortnight.

122. It is really an extension of Table B?—It would be called so. It is simply to give the Commission some knowledge of the conditions existing at present. The order of percentages is about the same as for the half-year ended 31/12/24.

123. *By Mr. Robinette*—During the fortnight ended March 11th, 1925, were not a large number of foreigners discharged in order to make room for an influx of wharf laborers?—I could not say that at all. I was in Melbourne at that time.

124. *By Mr. Gepp*—When was the industry established at Port Pirie?—In 1889, I understand, the smelters started.

125. How many men have the smelters usually employed from the date when they were really established and run until

the present period?—The number would range between 1,000 and 2,500 men employed on any one day.

126. What was the number in 1900 and again in 1914?—In 1900, I understand, about 1,200 men were employed, and in 1914 practically the same number.

127. Have you any information touching on lead poisoning or suspected lead poisoning?—I have had a number of tables prepared giving certain details. They contain an analysis of the reported cases of lead poisoning. I put in the tables, which are marked C, D, E, F, G, H, K, and L.

TABLE "C."—REPORTED CASES OF LEAD POISONING.

Number of Persons Compensated for Lead Poisoning for the Period 28/6/17 *to* 11/3/25.

Half-year ended.	Nationality.																Total.	
	British.		Greek.		Maltese.		Italian.		German.		Scandinvn.		Russian.		Others.			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
26/12/17	1	(100·00) ·40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0·23
26/6/18	3	(75) 1·18	—	—	—	—	—	—	—	—	—	—	—	—	1	(25·00) 7·69	4	0·93
25/12/18	1	(100·00) ·40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0·23
25/6/19	2	(100·00) ·79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	0·47
23/12/19	3	(100·00) 1·18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	0·70
23/6/20	4	(100·00) 1·57	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	0·93
22/12/20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
22/6/21	—	—	—	—	—	—	—	—	—	—	1	(100·00) 12·5	—	—	—	—	1	0·23
21/12/21	2	(100·00) ·79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	0·47
21/6/22	20	(83·33) 7·87	1	(4·17) 1·39	—	—	—	—	—	—	—	—	2	(8·33) 25·0	1	(4·17) 7·69	24	5·59
20/12/22	28	(87·51) 11·02	2	(6·25) 2·78	—	—	1	(3·12) 3·33	—	—	1	(3·12) 12·5	—	—	—	—	32	7·50
20/6/23	30	(78·93) 11·81	2	(5·27) 2·78	1	(2·63) 2·70	2	(5·27) 6·67	—	—	2	(5·27) 25·0	—	—	1	(2·63) 7·69	38	8·86
19/12/23	37	(72·55) 14·57	9	(17·65) 12·50	—	—	2	(3·92) 6·67	2	(3·92) 28·57	—	—	—	—	1	(1·96) 7·69	51	11·88
2/7/24	57	(55·34) 22·43	23	(22·34) 31·94	4	(3·88) 10·81	10	(9·71) 33·33	2	(1·94) 28·57	1	(0·97) 12·5	2	(1·94) 25·0	4	(3·88) 30·78	103	24·00
31/12/24	53	(40·47) 20·87	31	(23·66) 43·05	24	(18·32) 64·87	13	(9·92) 43·33	1	(0·76) 14·29	2	(1·53) 25·0	4	(3·05) 50·0	3	(2·29) 23·08	131	30·53
1/1/25 to 11/3/25	13	(40·62) 5·12	4	(12·50) 5·56	8	(25·00) 21·62	2	(6·25) 6·67	2	(6·25) 28·57	1	(3·13) 12·5	—	—	2	(6·25) 15·38	32	7·45
Total	254	(59·22) 100·00	72	(16·79) 100·00	37	(8·62) 100·00	30	(6·99) 100·00	7	(1·63) 100·00	8	(1·86) 100·00	8	(1·86) 100·00	13	(3·03) 100·00	429	100·00

Numbers in parentheses represent percentage of the total numbers in the last column. Numbers not in parentheses represent percentages of the totals at the foot of the table.

TABLE "D."—REPORTED CASES OF LEAD POISONING.

Length of Service in Relation to Nationality for the Period 28/6/17 *to* 11/3/25.

Nationality.	Months.										Years.					Total.
	Up to 3.	4 to 6.	7 to 9.	10 to 12.	13 to 18.	19 to 24.	25 to 48.	49 to 72.	73 to 96.	97 to 120.	Over 10 and up to 15.	16 to 20.	21 to 25.	26 to 30.	Over 30.	
British	(4·72) 12 54·55	(7·09) 18 45·00	(6·30) 16 45·71	(1·57) 4 16·00	(3·55) 9 23·08	(5·51) 14 37·84	(11·02) 28 59·58	(12·99) 33 70·74	(10·24) 26 74·28	(8·66) 22 81·49	(9·05) 23 79·31	(7·09) 18 100·00	(7·09) 18 94·74	(1·97) 5 100·00	(3·15) 8 100·00	(100·00) 254 59·23
Greek	(5·55) 4 18·18	(16·67) 12 30·00	(9·72) 7 20·00	(15·28) 11 44·00	(22·22) 16 41·03	(11·11) 8 21·62	(11·11) 8 17·02	(2·78) 2 4·65	(4·17) 3 8·57	(1·39) 1 3·70	— —	— —	— —	— —	— —	(100·00) 72 16·78
Maltese	(2·70) 1 4·54	(8·11) 3 7·50	(18·92) 7 20·00	(16·22) 6 24·00	(18·92) 7 17·95	(27·02) 10 27·03	(8·11) 3 6·38	— —	— —	— —	— —	— —	— —	— —	— —	(100·00) 37 8·62
Italian	(16·67) 5 22·73	(13·33) 4 10·00	(13·33) 4 11·43	(6·67) 2 8·00	(16·67) 5 12·82	(10·00) 3 8·11	(10·00) 3 6·38	(10·00) 3 6·98	(3·33) 1 2·86	— —	— —	— —	— —	— —	— —	(100·00) 30 6·99
German	— — —	(28·57) 2 5·00	— — —	— — —	— — —	(14·29) 1 2·70	— — —	(14·28) 1 2·33	(14·29) 1 2·86	(14·28) 1 3·70	(14·29) 1 1·45	— — —	— — —	— — —	— — —	(100·00) 7 1·63
Scandinavian	— — —	— — —	— — —	— — —	— — —	(12·50) 1 2·70	— — —	— — —	(25·00) 2 5·71	(12·50) 1 3·70	(50·00) 4 13·79	— — —	— — —	— — —	— — —	(100·00) 8 1·87
Russian	— — —	— — —	— — —	— — —	(12·50) 1 2·56	— — —	(50·00) 4 8·51	(25·00) 2 4·65	(12·50) 1 2·86	— — —	— — —	— — —	— — —	— — —	— — —	(100·00) 8 1·87
Others	— — —	(7·69) 1 2·50	(7·69) 1 2·86	(15·39) 2 8·00	(7·69) 1 2·56	— — —	(7·69) 1 2·13	(15·38) 2 4·65	(7·70) 1 2·86	(15·39) 2 7·41	(7·69) 1 3·45	— — —	(7·69) 1 5·26	— — —	— — —	(100·00) 13 3·03
Total	(5·13) 22 100·00	(9·32) 40 100·00	(8·16) 35 100·00	(5·83) 25 100·00	(9·09) 39 100·00	(8·62) 37 100·00	(10·96) 47 100·00	(10·02) 43 100·00	(8·16) 35 100·00	(6·29) 27 100·00	(6·76) 29 100·00	(4·20) 18 100·00	(4·43) 19 100·00	(1·16) 5 100·00	(1·87) 8 100·00	(100·00) 429 100·00

Numbers in parenthesis represent percentages of the total numbers in the last column. Smaller figures represent percentages of the numbers at the foot of the table.

TABLE "E."—REPORTED CASES OF LEAD POISONING.

Length of Disability in Relation to Department of Origin of Contraction of Disease, 28/6/17 to 11/3/25.

Department.	Weeks of Disability.																Total.	
	4 & under.		5 to 13.		14 to 26.		27 to 39.		40 to 52.		53 to 78.		79 to 104.		105 & over.			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Refinery	20	(21·98) 20·84	22	(24·18) 20·76	10	(10·99) 20·41	8	(8·79) 20·51	6	(6·59) 37·50	—	—	6	(6·59) 42·86	19	(26·88) 19·39	91	(100·00) 21·22
Top Floor	12	(20·69) 12·50	19	(32·76) 17·92	8	(13·79) 16·33	3	(5·17) 7·69	4	(6·90) 25·00	1	(1·72) 9·09	—	—	11	(18·97) 11·23	58	(100·00) 13·52
Bottom Floor	22	(27·50) 22·92	19	(23·75) 17·92	11	(13·75) 22·45	9	(11·25) 23·08	1	(1·25) 6·25	2	(2·50) 18·18	1	(1·25) 7·14	15	(18·75) 15·31	80	(100·00) 18·65
Dwight & Lloyd	16	(25·00) 16·67	13	(20·32) 12·26	3	(4·69) 6·12	4	(6·25) 10·26	—	—	5	(7·81) 45·46	2	(3·12) 14·29	21	(32·81) 21·42	64	(100·00) 14·92
Huntington-Herberlein	8	(19·05) 8·33	5	(11·91) 4·72	11	(26·91) 22·45	8	(19·05) 20·51	4	(9·52) 25·00	2	(4·76) 18·18	—	—	4	(9·52) 4·08	42	(100·00) 9·79
Ropp Roasters	—	—	5	(45·45) 4·72	—	—	—	—	—	—	—	—	—	—	6	(54·55) 6·12	11	(100·00) 2·56
Heap Sintering	—	—	1	(100·00) 0·94	—	—	—	—	—	—	—	—	—	—	—	—	1	(100·00) 0·23
Ore Discharging	1	(33·33) 1·04	2	(66·67) 1·89	—	—	—	—	—	—	—	—	—	—	—	—	3	(100·00) 0·70
Slag Pit	1	(25·00) 1·04	—	—	1	(25·00) 2·04	—	—	—	—	—	—	—	—	2	(50·00) 2·04	4	(100·00) 0·93
Skinner	2	(28·56) 2·08	3	(42·86) 2·83	1	(14·29) 2·04	1	(14·29) 2·56	—	—	—	—	—	—	—	—	7	(100·00) 1·63
Acid Plant	1	(100·00) 0·94	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	(100·00) 0·23
Service	13	(19·40) 13·54	17	(25·38) 16·04	4	(5·97) 8·16	6	(8·96) 15·39	1	(1·49) 6·25	1	(1·49) 9·09	5	(7·46) 35·71	20	(29·85) 20·41	67	(100·00) 15·62
Total	96	(22·38) 100·00	106	(24·72) 100·00	49	(11·42) 100·00	39	(9·09) 100·00	16	(3·73) 100·00	11	(2·56) 100·00	14	(3·26) 100·00	98	(22·84) 100·00	429	(100·00) 100·00

Numbers in parentheses represent percentages of the total numbers in the last column. Numbers not in parentheses represent percentages of the totals, at the foot of the table.

TABLE "F"—REPORTED CASES OF LEAD POISONING.

Length of Disability in Relation to Length of Service, Period 28/6/17 to 11/3/25.

Weeks of Disability.	Months of Service.										Years.					Total.
	Up to 3.	4 to 6.	7 to 9.	10 to 12.	13 to 18.	19 to 24.	25 to 48.	49 to 72.	73 to 96.	97 to 120.	Over 10 and up to 15.	16 to 20.	21 to 25.	26 to 30.	31 and Over.	
Up to 4	(10·42) 10 45·46	(12·50) 12 30·00	(16·67) 16 45·71	(7·29) 7 28·00	(5·21) 5 12·82	(7·29) 7 18·91	(11·46) 11 23·40	(10·42) 10 23·25	(4·16) 4 11·43	(3·12) 3 11·11	(5·21) 5 17·24	(2·08) 2 11·11	(4·17) 4 21·05	— — —	— — —	(100·00) 96 22·38
5 to 13	(7·55) 8 36·36	(10·38) 11 27·50	(12·26) 13 37·14	(5·66) 6 24·00	(7·55) 8 20·51	(12·26) 13 35·13	(15·09) 16 34·04	(7·55) 8 18·60	(6·60) 7 20·00	(5·66) 6 22·22	(6·33) 5 17·24	(3·80) 3 16·66	— — —	(2·53) 2 40·00	— — —	(100·00) 106 24·71
14 to 26	(4·08) 2 9·09	(22·45) 11 27·50	(6·12) 3 8·57	(14·29) 7 28·00	(14·29) 7 17·95	(14·29) 7 18·92	(6·12) 3 6·38	(6·12) 3 6·98	(6·12) 3 8·57	(2·04) 1 3·70	(4·08) 2 6·89	— — —	— — —	— — —	— — —	(100·00) 49 11·42
27 to 39	(5·12) 2 9·09	(10·26) 4 10·00	(2·56) 1 2·86	(5·13) 2 8·00	(33·33) 13 33·34	(5·13) 2 5·41	(12·82) 5 10·64	(7·69) 3 6·98	(7·69) 3 8·57	(5·13) 2 7·41	(1·27) 1 3·45	(1·27) 1 5·56	— — —	— — —	— — —	(100·00) 39 9·09
40 to 52	— — —	(6·25) 1 2·50	(6·25) 1 2·86	(12·50) 2 8·00	(18·75) 3 7·69	(12·50) 2 5·41	(12·50) 2 4·26	(6·25) 1 2·33	(12·50) 2 5·71	(6·25) 1 3·70	(6·25) 1 3·45	— — —	— — —	— — —	— — —	(100·00) 16 3·73
53 to 78	— — —	— — —	(9·09) 1 2·86	— — —	(9·09) 1 2·56	(27·27) 3 8·11	(9·09) 1 2·13	(27·27) 3 6·98	— — —	— — —	(9·09) 1 3·45	(9·10) 1 5·56	— — —	— — —	— — —	(100·00) 11 2·57
79 to 104	— — —	— — —	— — —	(7·14) 1 4·00	(14·29) 2 5·13	— — —	(7·14) 1 2·13	(21·43) 3 6·98	(35·71) 5 14·29	(14·29) 2 7·41	— — —	— — —	— — —	— — —	— — —	(100·00) 14 3·26
105 and over	— — —	(1·02) 1 2·50	— — —	— — —	— — —	(3·06) 3 8·11	(8·16) 8 17·02	(12·25) 12 23·90	(11·23) 11 31·43	(12·25) 12 44·45	(14·28) 14 48·28	(11·23) 11 61·11	(15·30) 15 78·95	(3·06) 3 60·00	(8·16) 8 100·00	(100·00) 98 22·84
Total	(5·13) 22 100·00	(9·32) 40 100·00	(8·16) 35 100·0	(5·83) 25 100·00	(9·09) 39 100·00	(8·62) 37 100·00	(10·96) 47 100·00	(10·02) 43 100·00	(8·16) 35 100·00	(6·29) 27 100·00	(6·76) 29 100·00	(4·20) 18 100·00	(4·43) 19 100·00	(1·16) 5 100·00	(1·87) 8 100·00	(100·00) 429 100·00

Numbers in parentheses represent percentages of the total in the last column. Smaller figures represent percentages of the totals at the foot of the table.

TABLE "G."—REPORTED CASES OF LEAD POISONING.

Length of Disability in Relation to Nationality. Period 28/6/17 *to* 11/3/25.

Nationality.	Weeks of Disability.																Total.	
	Under 4.		5 to 13.		14 to 26.		27 to 39.		40 to 52.		53 to 78.		79 to 104.		Over 105.			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
B. British	59	(23·23) 61·46	63	(24·80) 59·43	13	(5·12) 26·53	14	(5·51) 35·89	4	(1·57) 25·00	5	(1·97) 45·46	9	(3·55) 64·29	87	(34·25) 88·78	1254	(100·00) 59·21
G. Greek	12	(16·67) 12·50	14	(19·44) 13·21	12	(16·67) 24·49	17	(23·60) 43·59	9	(12·50) 56·25	3	(4·17) 27·27	2	(2·78) 14·29	3	(4·17) 3·06	72	(100·00) 16·78
M. Maltese	11	(29·74) 11·46	12	(32·43) 11·32	9	(24·32) 18·37	2	(5·41) 5·13	1	(2·70) 6·25	1	(2·70) 9·09	1	(2·70) 7·14	—	—	37	(100·00) 8·62
X. Italian	5	(16·67) 5·21	11	(36·68) 10·38	7	(23·33) 14·29	4	(13·33) 10·26	—	—	—	—	1	(3·33) 7·14	2	(6·66) 2·04	30	(100·00) 6·99
H. German	—	—	2	(28·57) 1·89	2	(28·57) 4·08	—	—	1	(14·29) 6·25	2	(28·57) 18·18	—	—	—	—	7	(100·00) 1·63
S. Scandinavian	3	(37·50) 3·12	—	—	1	(12·50) 2·04	—	—	1	(12·50) 6·25	—	—	1	(12·50) 7·14	2	(25·00) 2·04	8	(100·00) 1·87
R. Russian	1	(12·50) 1·04	3	(37·50) 2·83	3	(37·50) 6·12	—	—	—	—	—	—	—	—	1	(12·50) 1·02	8	(100·00) 1·87
Others	5	(38·46) 5·21	1	(7·69) 0·94	2	(15·38) 4·08	2	(15·38) 5·13	—	—	—	—	—	—	3	(23·09) 3·06	13	(100·00) 3·03
Total	96	(22·38) 100·00	106	(24·72) 100·00	49	(11·42) 100·00	39	(9·09) 100·00	16	(3·73) 100·00	11	(2·56) 100·00	14	(3·26) 100·00	98	(22·84) 100·00	429	(100·00) 100·00

Numbers in parentheses represent the percentages to the total in the last column. Numbers not in parentheses represent the percentages to the totals at the foot of the table.

TABLE "H."—REPORTED CASES OF LEAD POISONING.

Ages of Persons Compensated for Lead Poisoning for the Period 28/6/17 *to* 11/3/25 *in relation to Nationalities.*

Nationality.	Ages—Years.																		Total.	
	21 & under.		22 to 25.		26 to 30.		31 to 35.		36 to 40.		41 to 45.		46 to 50.		51 to 55.		56 to 60.		Over 60.			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
B. British	7	(2·76) 77·78	24	(9·45) 46·15	38	(14·96) 46·91	41	(16·14) 51·25	46	(18·10) 62·16	26	(10·24) 65·00	25	(9·84) 71·43	16	(6·30) 69·56	18	(7·09) 85·72	13	(5·12) 92·86	254	(100·00) 59·21
G. Greek	1	(1·39) 11·11	10	(13·89) 19·23	23	(31·95) 28·40	17	(23·61) 21·25	10	(13·89) 13·51	4	(5·55) 10·00	6	(8·33) 17·14	—	—	1	(1·39) 4·76	—	—	72	(100·00) 16·78
M. Maltese	—	—	11	(29·72) 21·15	10	(27·02 12·35	9	(24·32) 11·25	3	(8·11) 4·05	2	(5·41) 5·00	2	(5·41) 5·71	—	—	—	—	—	—	37	(100·00) 8·62
X. Italian	1	(3·33) 11·11	5	(16·67) 9·62	8	(26·67) 9·88	5	(16·67) 6·25	6	(20·00) 8·11	3	(10·00) 7·50	1	(3·33) 2·86	1	(3·33) 4·34	—	—	—	—	30	(100·00) 6·99
H. German	—	—	—	—	1	(14·29) 1·23	—	—	2	(28·57) 2·70	1	(14·29) 2·50	1	(14·29) 2·86	2	(28·56) 8·70	—	—	—	—	7	(100·00 1·63
S. Scandinavian	—	—	—	—	—	—	1	(12·5) 1·25	3	(37·5) 4·06	1	(12·5) 2·50	—	—	2	(25·0) 8·70	1	(12·5) 4·76	—	—	8	(100·00) 1·87
R. Russian	—	—	—	—	—	—	4	(50·0) 5·00	3	(37·5) 4·06	—	—	—	—	—	—	—	—	1	(12·5) 7·14	8	(100·00) 1·87
O. Others	—	—	2	(15·38) 3·85	1	(7·69) 1·23	3	(23·08) 3·75	1	(7·69) 1·35	3	(23·09) 7·50	—	—	2	(15·38) 8·70	1	(7·69) 4·76	—	—	13	(100·00) 3·03
Total	9	(2·10) 100·00	52	(12·12) 100·00	81	(18·88) 100·00	80	(18·65) 100·00	74	(17·25) 100·00	40	(9·32) 100·00	35	(8·16) 100·00	23	(5·36) 100·00	21	(4·90) 100·00	14	(3·26) 100·00	429	(100·00) 100·00

Numbers in parentheses represent the percentages to the total in the last column. Numbers not in parentheses represent the percentages to the totals at the foot of the table.

TABLE "K."—REPORTED CASES OF LEAD POISONING.

Ages of Persons contracting Lead Poisoning in relation to Length of Disability. Period 28/6/17 *to* 11/3/25.

Age.	Weeks of Disability.																Total.	
	4 & under.		5 to 13.		14 to 26.		27 to 39.		40 to 52.		53 to 78.		79 to 104.		105 & over.			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Up to 21	2	(22·22) 2·08	4	(44·45) 3·77	2	(22·22) 4·08	1	(11·11) 2·56	—	—	—	—	—	—	—	—	9	(100·00) 2·10
22 to 25	22	(42·31) 22·92	16	(30·77) 15·10	8	(15·39) 16·33	4	(7·69) 10·26	1	(1·92) 6·25	—	—	—	—	1	(1·92) 1·02	52	(100·00) 12·12
26 to 30	24	(29·63) 25·00	25	(30·87) 23·59	7	(8·64) 14·29	10	(12·35) 25·64	3	(3·70) 18·75	3	(3·70) 27·27	3	(3·70) 21·43	6	(7·41) 6·12	81	(100·00) 18·88
31 to 35	16	(20·00) 16·67	19	(23·75) 17·92	12	(15·00) 24·49	8	(10·00) 20·51	6	(7·50) 37·50	5	(6·25) 45·46	8	(10·00) 57·14	6	(7·50) 6·12	80	(100·00) 18·65
36 to 40	11	(14·87) 11·46	23	(31·08) 21·70	8	(10·81) 16·33	9	(12·16) 23·08	2	(2·70) 12·50	2	(2·70) 18·18	2	(2·70) 14·29	17	(22·98) 17·35	74	(100·00) 17·25
41 to 45	9	(22·50) 9·38	7	(17·50) 6·60	4	(10·00) 8·16	5	(12·50) 12·82	1	(2·50) 6·25	—	—	1	(2·50) 7·14	13	(32·50) 13·27	40	(100·00) 9·32
46 to 50	7	(20·00) 7·29	8	(22·86) 7·55	6	(17·14) 12·24	2	(5·71) 5·13	1	(2·86) 6·25	1	(2·86) 9·09	—	—	10	(28·57) 10·20	35	(100·00) 8·16
51 to 55	2	(8·70) 2·08	3	(13·04) 2·83	2	(8·70) 4·08	—	—	1	(4·35) 6·25	—	—	—	—	15	(65·21) 15·31	23	(100·00) 5·36
56 to 60	1	(4·76) 1·04	—	—	—	—	—	—	1	(4·76) 6·25	—	—	—	—	19	(90·48) 19·39	21	(100·00) 4·90
Over 60	2	(14·29) 2·08	1	(7·14) 0·94	—	—	—	—	—	—	—	—	—	—	11	(78·57) 11·22	14	(100·00 3·26
Total	96	(22·38) 100·00	106	(24·72) 100·00	49	(11·42) 100·00	39	(9·09) 100·00	16	(3·73) 100·00	11	(2·56) 100·00	14	(3·26) 100·00	98	(22·84) 100·00	429	(100·00) 100·00

Numbers in parentheses represent the percentages to the total in the last column. Numbers not in parentheses represent the percentages to the totals at the foot of the table.

TABLE "L."—INDUSTRIAL DISEASE (LEAD POISONING).

28/6/17 to 31/12/24.

	26/12/17	26/6/18	25/12/18	25/6/19	23/12/19	23/6/20	22/12/20	22/6/21	21/12/21	21/6/22	20/12/22	20/6/23	19/12/23	2/7/24	31/12/24	1/1/25 to 31/5/25
SUMMARY—																
Total number of individuals employed during half-year ended	—	—	—	—	2,412	1,415	1,302	905	1,338	1,545	1,746	2,308	2,213	2,552	2,615	2,650
Average daily strength	—	—	—	—	1,079*a*	651*a*	794*a*	419*a*	683*a*	1,604	1,208	1,339	1,430	1,593	1,601	1,681
Total number of lead cases during half-year ended	1	4	1	2	3	4	—	1	2	24	32	38	51	103	131	126
Total lead cases as per cent. on total employed during half-year ended	—	—	—	—	0·124	0·283	—	0·110	0·149	1·553	1·833	1·646	2·305	4·036	5·010	4·755
BRITISH—																
Total number employed during half-year ended	—	—	—	—	2,019	1,256	1,167	830	1,180	1,366	1,471	1,819	1,714	1,853	1,761	1,818
% of total number of individuals employed during half-year ended	—	—	—	—	83·706	88·763	89·631	91·713	88·191	88·414	84·25	78·813	77·451	72·61	67·342	68·604
Total number of lead cases during half-year ended	1	3	1	2	3	4	—	—	2	20	28	30	37	57	53	38
% lead cases on total lead cases during half-year ended	100·00	75·00	100·00	100·00	100·00	100·00	—	—	100·00	83·33	87·50	78·96	72·55	55·34	40·46	30·16
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	0·124	0·283	—	—	0·149	1·294	1·604	1·299	1·672	2·234	2·027	1·434
% lead cases on total number of British employed during half-year ended	—	—	—	—	0·149	0·318	—	—	0·169	1·464	1·903	1·649	2·159	3·076	3·010	2·020
TOTAL FOREIGNERS—																
Total number employed during half-year ended	—	—	—	—	393	159	135	75	138	179	275	489	499	699	854	832
% of total number of individuals employed during half-year ended	—	—	—	—	16·294	11·237	10·369	8·287	11·809	11·586	15·75	21·187	22·549	27·39	32·658	31·306
Total number of lead cases during half-year ended	—	1	—	—	—	—	—	1	—	4	4	8	14	46	78	88
% lead cases on total lead cases during half-year ended	—	25·00	—	—	—	—	—	100·00	—	16·67	12·50	21·04	27·45	44·66	59·54	69·84
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	0·110	—	0·259	0·229	0·347	0·433	1·803	2·983	3·321
% lead cases on total number of Foreigners employed during half-year ended	—	—	—	—	—	—	—	1·333	—	2·235	1·454	1·636	2·806	6·780	9·133	10·577
GREEKS—																
Total number employed during half-year ended	—	—	—	—	124	33	27	5	31	39	61	117	207	336	465	435
% of total number of individuals employed during half-year ended	—	—	—	—	5·140	2·332	2·074	0·552	2·317	2·524	3·494	5·069	9·354	13·166	17·782	16·415
Total number of lead cases during half-year ended	—	—	—	—	—	—	—	—	—	1	2	2	9	23	31	54
% lead cases on total lead cases during half-year ended	—	—	—	—	—	—	—	—	—	4·17	6·26	5·26	17·65	22·34	23·67	42·86
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	—	—	0·065	0·115	0·087	0·407	0·901	1·186	2·038
% lead cases on total number of Greeks employed during half-year ended	—	—	—	—	—	—	—	—	—	2·564	3·279	1·709	4·348	6·845	6·667	12·414
MALTESE—																
Total number employed during half-year ended	—	—	—	—	56	4	3	2	13	21	47	110	95	137	96	83
% of total number of individuals employed during half-year ended	—	—	—	—	2·322	0·283	0·230	0·221	0·972	1·359	2·692	4·766	4·293	5·369	3·671	3·132
Total number of lead cases during half-year ended	—	—	—	—	—	—	—	—	—	—	—	1	—	4	24	15
% lead cases on total lead cases during half-year ended	—	—	—	—	—	—	—	—	—	—	—	2·63	—	3·88	18·32	11·90
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	—	—	—	—	0·043	—	0·157	0·918	0·566
% lead cases on total number of Maltese employed during half-year ended	—	—	—	—	—	—	—	—	—	—	—	0·909	—	2·919	27·00	15·072
ITALIANS—																
Total number employed during half-year ended	—	—	—	—	35	12	13	8	26	35	72	138	76	100	144	148
% of total number of individuals employed during half-year ended	—	—	—	—	1·451	0·848	0·998	0·884	1·943	2·266	4·124	5·979	3·434	3·918	5·507	5·585
Total number of lead cases during half-year ended	—	—	—	—	—	—	—	—	—	—	1	2	2	10	13	2
% lead cases on total lead cases during half-year ended	—	—	—	—	—	—	—	—	—	—	3·12	5·26	3·92	9·71	9·92	1·59
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	—	—	—	0·057	0·087	0·090	0·392	0·497	0·075
% lead cases on total number of Italians employed during half-year ended	—	—	—	—	—	—	—	—	—	—	1·389	1·449	2·632	10·00	9·028	1·351
GERMANS—																
Total number employed during half-year ended	—	—	—	—	54	42	41	28	41	36	34	35	32	33	24	24
% of total number of individuals employed during half-year ended	—	—	—	—	2·239	2·969	3·149	3·094	3·064	2·331	1·947	1·517	1·446	1·293	0·918	0·906
Total number of lead cases during half-year ended	—	—	—	—	—	—	—	—	—	—	1	—	2	2	1	4
% lead cases on total lead cases during half-year ended	—	—	—	—	—	—	—	—	—	—	3·12	—	3·92	1·94	0·76	3·17
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	—	—	—	0·057	—	0·090	0·078	0·038	0·151
% lead cases on total number of Germans employed during half-year ended	—	—	—	—	—	—	—	—	—	—	1·389	—	6·250	6·061	4·167	16·667
SCANDANAVIANS—																
Total number employed during half-year ended	—	—	—	—	49	27	22	18	23	24	21	24	37	40	54	59
% of total number of individuals employed during half-year ended	—	—	—	—	2·032	1·908	1·690	1·989	1·719	1·553	1·203	1·040	1·672	1·567	2·065	2·226
Total number of lead cases during half-year ended	—	—	—	—	—	—	—	1	—	—	1	2	—	1	2	3
% lead cases on total lead cases during half-year ended	—	—	—	—	—	—	—	100·00	—	—	3·12	5·26	—	0·97	1·53	2·38
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	0·110	—	—	0·057	0·087	—	0·039	0·076	0·113
% lead cases on total number of Scandanavians employed during half-year ended	—	—	—	—	—	—	—	5·555	—	—	4·762	8·333	—	2·500	3·704	5·085
RUSSIANS—																
Total number employed during half-year ended	—	—	—	—	47	32	27	14	15	14	17	25	24	25	29	22
% of total number of individuals employed during half-year ended	—	—	—	—	1·949	2·261	2·074	1·547	1·121	0·906	0·973	1·083	1·085	0·980	1·109	0·830
Total number of lead cases during half-year ended	—	—	—	—	—	—	—	—	—	2	—	—	—	2	4	—
% lead cases on total lead cases during half-year ended	—	—	—	—	—	—	—	—	—	8·33	—	—	—	1·94	3·05	—
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	—	—	0·129	—	—	—	0·078	0·153	—
% lead cases on total number of Russians employed during half-year ended	—	—	—	—	—	—	—	—	—	14·286	—	—	—	8·00	13·793	—
OTHERS—																
Total number employed during half-year ended	—	—	—	—	28	9	2	—	9	10	23	40	28	28	42	61
% of total number of individuals employed during half-year ended	—	—	—	—	1·161	0·636	0·154	—	0·673	0·647	1·317	1·733	1·265	1·097	1·606	2·302
Total number of lead cases during half-year ended	—	1	—	—	—	—	—	—	—	1	—	1	1	4	3	10
% lead cases on total lead cases during half-year ended	—	25·00	—	—	—	—	—	—	—	4·17	—	2·63	1·96	3·88	2·29	7·94
% lead cases on total number of individuals employed during half-year ended	—	—	—	—	—	—	—	—	—	0·065	—	0·043	0·045	0·157	0·114	0·378
% lead cases on total number of others employed during half-year ended	—	—	—	—	—	—	—	—	—	10·00	—	2·500	3·571	14·286	7·143	16·393

a During these periods the rotation scheme was in operation.

The tables practically cover the period of my employment with the company, that is, from the middle of 1917 to the end of the third month in 1925. Table C shows the reported cases of lead poisoning gauged by the number of persons compensated for lead poisoning for the period 26/6/17 to 11/3/25.

128. The table covers practically eight years of the figures on the reported cases?—Yes.

129. What do you mean by reported cases?—Those cases which are regarded as plumbism on the certificates of the doctors.

130. What connection have those cases with the Workmen's Compensation Act. Are they all Workmen's Compensation Act cases?—Yes.

131. We may take it those are the compensable cases?—Yes.

132. What is the meaning of the red figures and the black figures in the tables?—If you look at the first period you will see that one Britisher was compensated for lead poisoning under a doctor's certificate in the half-year ended 26/12/17, and that he represented 100 per cent. of the cases for that period. He also represented .4 per cent. of the total number of British cases of lead poisoning that occurred in the eight years. Then there is another figure in the total column on the right-hand side of the table, which gives the total number of cases. That shows that this Britisher, whose case occurred in the half-year ended 26/12/17, represented 0.23 per cent. of the total cases we have compensated for lead poisoning, including both foreigners and Britishers.

(NOTE.—The red figures referred to are printed in parentheses.—J. S., Sec.)

133. Will you take one or two other causes as illustrative for the Commission's information?—Yes. Take, for example, the period ended 2/7/24. In that half-year there were 57 British, 23 Greek, 4 Maltese, 10 Italian, 2 German, 1 Scandinavian, and 4 unspecified (other nationalities) cases, or 103 cases in all. The 57 Britishers represented 55.34 per cent. of the total cases in that half year. They also represented 22.43 per cent. of all the British cases that occurred in the eight years. The 23 Greeks represented 41.94 per cent. of all the Greek cases in the eight years, and 22.34 per cent. of all the cases in that half-year.

134. This table indicates an average of slightly over 50 reported cases per year, with a large increase during recent years?—Yes.

135. At the moment I understand that the indications are that the cases are increasing?—That is so. The reported cases are increasing at the moment.

136. We have no indication whether this particular rise beginning in 1923 is likely to be permanent under present conditions, or whether it will ease off again?—I have no idea about that. As a matter of fact the whole thing is incomprehensible to me. The cases continue to increase despite the fact that we are continually improving the working conditions.

137. There has been a substantial increase in the reported cases of late, and particularly in the last few months?—Particularly in the last six or seven months there has been a considerable increase.

138. Is the increase general?—No. By far the bigger percentage of cases are coming from among the foreign element.

139. Have those foreigners been with you long?—The greater number have been employed for comparatively a short time—around 12 months would be their average length of service.

140. To what do you attribute the recent increase in the number of reported cases?—If the cases are genuine, then I am at a loss to account for it. We have been constantly improving the working conditions on the plant for some years past, and yet the cases continue to increase right up to the present time.

141. To what do you attribute the greater susceptibility of the foreigner?—If the cases are lead poisoning cases then I can only think that it may be due to the habits of life of the foreigner, to the fact that he is a man of poorer physique on the average than the Britisher, and to the fact that when they originally come here they do not look particularly healthy people. Of course, I refer to the majority of them.

142. I understand that in 1922 the ratio of foreigners to British was much lower than it is to-day. Those figures, I believe, are shown in another table?—Yes.

143. The figures show, I understand, that in 1922 there was one foreigner to every eight Britishers, whereas in 1924 the proportion had increased to one foreigner to two Britishers?—That is so.

144. Why is this?—It is simply because in the last year or so we have considerably increased our labor forces, due to a great deal of constructional work that is going on, and, being unable to obtain British labor, we have been forced to engage foreigners as the only labor available at the gate. The increase in our labor force has been to a very large extent an increase of foreign labor.

145. Is that due to a big construction programme?—Yes.

146. If there were a reduction in the number of employees the ratio would come nearer to the 1922 ratio?—I think it would come back approximately to the same figure.

147. Does the type of work which the British workman does compare with the work done by the foreigner?—They do similar types of work throughout the plant.

148. Therefore, assuming that the reported cases of plumbism are genuine, does it not appear very definite that the foreign labor is more susceptible to lead than the Britisher?—The figures make that appear so.

149. Can you assign any reason for that?—No. I cannot add anything to what I have said.

150. Do a great number of the foreigners batch together in houses in the town?—I have heard so, but I cannot say definitely that it is done.

151. Has your company any preference between British and foreign labor?—Yes. Preference to Britishers.

152. Is that preference exercised?—Yes. Whenever British labor is available at the gate the Britisher is given preference over foreigners who are available there, provided he is an employable man.

153. The position you have indicated in regard to reported cases of lead poisoning suggests that the hygienic conditions in your works have become seriously worse than formerly. Is that so?—Most decidedly not. In fact, they are very much better than formerly. For years past we have been making every effort to improve working places around the plant, and the effect to those of us who have been here during these years is very noticeable.

154. That is, you will be able to produce evidence of very great improvements in all matters connected with the health hazard?—Yes.

155. Yet these figures are increasing?—The figures indicate that the conditions are becoming worse.

156. You therefore fear that these figures and the whole position calls for most critical and careful examination?—That is what we are hoping will be made.

157. Because you cannot understand the position as represented?—I cannot understand it.

158. I presume the company has always appreciated that there is a certain health hazard in the process of lead smelting?—Yes. That is always recognised, but until the last few years the number of reported cases of lead poisoning was so few that we did not realise that there was any serious hazard in the industry as carried on at the time; but, despite that fact, we were continually trying to improve working places on the works, even before the big increase in the number of reported cases became evident.

159. What has been the company's policy in regard to this aspect of the industry—the health hazard?—As soon as the reported cases showed definite signs of increase, extra attention was given to the matter, and everything we could see we could do was done around the plant to make working conditions better.

160. The examples you propose to give are numerous?—Yes.

161. And involved very heavy expenditure?—Yes. Very heavy indeed, some of them.

162. Can you give any instances of a major type where action has been taken to improve working conditions? Take handling of raw material to start with?—That is done entirely differently from the way it was done when I joined the smelters. In those days the trucks were run up an incline over the top of bins that received the concentrates as they were shovelled from the trucks. These concentrates dropped into big bins so constructed that it was very often necessary for men to go inside them to bar down the ore, and ensure that it discharged decently from the bins. Those bins have been replaced by a scheme of unloading on to a travelling belt in the open air, and this belt delivers to bins which discharge so efficiently that it is not necessary for anyone to go inside them to remove the ore. Furthermore, there are fewer men employed around the new bins than were employed around the old bins.

163. How about the Dwight & Lloyd plant?—The Dwight and Lloyd plant as it stands to-day is a different one from that which existed in 1917, because early in 1921 the old Dwight and Lloyd plant was burnt out, and the present one substituted. When we were designing the new plant we gave, as we always do, the greatest consideration to the improvement of working conditions in the new plant as against those existent in the old plant. The building covering the old plant was largely enclosed, having end walls, back walls, and a roof that completely covered it.

164. I wish to interrupt your answer to that question to ask you about the cases enumerated in table C. Does that table cover all cases, whatever the period of illness?—Yes; all cases that have been certified as plumbism by doctors.

165. And many of them are of short duration?—Yes.

The witness withdrew.

ALFRED HENRY HART, laborer, 29 King Street, Solomontown, was sworn and examined:

166. *By the Chairman*—Where have you been employed recently?—The last place was the Barrier roasters. Previous to that I was a boilermaker's assistant at the Broken Hill Associated Smelters in Port Pirie.

167. *By Mr. Robinette*—How long have you worked at the smelters?—About 14 months.

168. Do you remember the 17th instant, when this Commission visited the works?—Yes.

169. Where were you working that day?—At the bag house, as boilermaker's assistant.

170. What happened that day in connection with your work? —We went to work as usual at 7.30 a.m. It was about 9 o'clock when I saw the Commission going through. The fumes up to that time were practically nil. After the Commission had gone past about half an hour the fumes began to come through, and we could see them plainly, also smell them plainly. I inquired of the baghouse attendant, "What is the stunt of starting these fans?" and he said, "You had better see Mr. Hughes." I at once informed my mate, George Dunbar, a boilermaker, and asked him what I should do. He instructed me to see Mr. Hughes and ask him if the fans could be stopped. I at once saw Mr. Hughes. He was on the bottom floor at the time. I asked if we could have the fan stopped, and said that otherwise we could not continue to work. He told me he had instructions from the manager that the fan was to kept going up to at least dinner time. He said, "I may be able to stop the fan after dinner. I will come along and let you know, anyway. Is there any other job you can get on with?" I went back to my mate and told him the fan could not be stopped. I detailed Mr. Hughes's reply word for word. My mate said, "We will go on plumbing up the uprights on the shaker gear outside the baghouse." The fumes were bad all day. After dinner Mr. Hughes came back. He did not speak to me, but spoke to my mate. We carried on all day the same as after the Commission arrived, working outside just pottering round. After the Commission had been gone about three days the men were supplied with respirators.

171. How long were you employed in the baghouse prior to the visit of the Commission?—Between two and three weeks.

172. What was the condition of the baghouse during that period?—Rather good. I went through every chamber one day. The only effect was that where there were fumes left in the chamber they made my eyes smart. Prior to the Commission's visit, the fan was always stopped during the night shift between 6 and 7 in the morning to let the chambers get free so that we could work in the baghouse.

173. Were there many fumes there caused by the attendant filling the trucks?—Yes. That was the main trouble we had. The baghouse attendant comes along and pushes his truck into the screw conveyor which winds the smoke out of the chambers. It goes down through a little pipe. Over that pipe they have a sort of bagging protector made of canvas. He undoes this and allows the smoke to run freely out of the chamber into the truck. It is fine, dry and hot, and the wind, if any, blows it all over the place.

174. Your work causes you to be employed on various parts of the works?—I have worked in practically every department of the smelters.

175. Which do you consider the worst place in the works for dust?—There are two places about equal—the Barrier roasters and the chambers of the Dwight & Lloyd.

176. What about the Dwight & Lloyd itself?—There it is more fumes than dust, where they turn the big cooking pots over. That is all on top of the Dwight & Lloyd. Then there are the fumes which come down from the stuff burnt on the pulettes.

177. You have worked in Broken Hill a lot?—Yes.

178. Underground or on the surface?—Both.

179. Do you consider the dust worse in the smelters at Port Pirie than on the surface in Broken Hill?—Absolutely.

180. You have worked in the acid plant?—Yes.

181. Have you suffered any ill effects through working there? —Yes. We were repairing pipes there, and some acid got into my eyes and I was blind for a whole day. I saw Dr. Tassie, who gave me a prescription.

182. Have you lost any time on the smelters through illness? —Yes. I have been off since last Friday—five days.

183. Did the doctor attend you?—Yes. I am under Dr. Dorsch. He told me I was suffering from bronchitis and influenza.

184. *By Mr. Gepp*—What nationality are you?—English.

185. Where were you born?—In Woolwich, London.

186. When did you come to Australia?—Just before Christmas, 1922.

187. Have you any trade?—No. I served in the war as a boy from the age of 14 years and eight months till the end of the war.

188. What is your age now?—Twenty-five.

189. Have you been all the time in South Australia?—No. I spent some time in Broken Hill and the remainder in South Australia.

190. You worked at Broken Hill, both underground and on the surface?—Yes.

191. On what plants?—South Mine, Block 14, and the Junction North.

192. What occupations did you follow there?—On the South Mine I was a fitter's laborer. On Block 14 I was a mullocker. On the Junction North I was a laborer on the roasters.

193. What periods did you work at each of these places? —Roughly, six months at the South Mine, three months at the Junction North, and six months underground at Block 14. The total time was, roughly, one year and three months.

194. Have you spent the rest of your time in Port Pirie?— No. I spent some time at Laura working for Mr. P. G. Humphries.

195. How long altogether have you been in Port Pirie?— Just over a year, I should say.

196. Your record at the smelters, which I have before me, shows that you worked for a period of five shifts in the refinery, 34 shifts on the Huntington-Heberlein, one on the

slag-pit, three at the refinery, one at the sample mill, six at the slag-pit, half on the Dwight & Lloyd, two on the slag-pit, 45 on the smelters, 11 handling and stacking, and 134 as boilermaker's assistant; and that during that period the lost time was four shifts at the refinery, the reason being that you left; two shifts absent without leave; three shifts when you were booked off; six shifts at the refinery, "work too hard"; four more shifts, "booked off"; and several other cases; showing a total of 83½ shifts lost time during that period. You did lose a considerable amount of time for one reason or another?—Yes.

197. Have you been absent for a number of shifts without leave?—Yes. Sometimes I did not feel up to the mark of going to my work.

Mr. Robinette—What has this to do with the inquiry? This is not a military inquiry.

The Chairman—We want to arrive at the actual amount of work done by the man.

Mr. Robinette—A man has a right to be absent without leave if he wants to. The witness does not want to be subjected to any indignity.

198. *By Mr. Gepp*—I desire to examine the witness's record at the works as part of his credibility generally?—During my work in Port Pirie it was broken because I am a member of the St. Mark's Band, and I found that through working shifts I could not attend band meetings. I managed to obtain casual employment with the Howard Smith Shipping Company so as to have my evenings free.

199. But you have been absent from work without advising the company?

Mr. Robinette—How does this affect the witness's credibility?

The Chairman—It is all relevant.

200. *By Mr. Gepp*—You were employed in and around the baghouse for from 14 to 21 days as a boilermaker's assistant?—About that length of time.

201. The conditions were rather good generally?—Yes.

202. What work were the boilermaker and yourself employed on? Did he have a man going into the baghouse at all, or was it all work done outside the baghouse?—Our real object was to erect a shaker-gear for the baghouse, but to do this, and to ensure that we had proper measurements, it was found necessary to go into each chamber to take measurements of its breadth and height.

203. How often would it mean going in every shift to do work inside the baghouse?—That rests with the boilermaker himself. One afternoon we spent two and a half hours there. We were paid time and a half for that work.

204. Were the other sections of the baghouse working regularly during these periods?—No. They were stopped.

205. The whole baghouse?—I did not visit the fans myself to see, but when we opened the doors and went in we found there was gas, but could see no fumes coming down from the top.

206. Do you understand the construction of the baghouse? Do you know it is divided into compartments?—Yes.

207. Which compartment were you working on?—To take measurements we visited every compartment. There are six compartments, and we worked from No. 6 towards No. 1 erecting the shaking gear outside the baghouse. In going along we found that the iron seemed to be about 2in. out. The boss of the boilermakers advised us to take measurements. We went into each chamber and found the walls had little inlets and outlets all the way, and we had to take bits off here and there, and bore different holes to make it fit.

208. Who was the boss of the boilermakers who gave Dunbar instructions?—Norris.

209. Is he a foreman or leading hand?—I should say a forcman. I hardly understand his real position, but he ranks next to Mr. Tonkin in the works.

210. Which fan were you sent to request Hughes to stop?—It is the fan where you see big black pipes coming out from the bottom floor tunnel. As the pipes take a junction off into the baghouse there is a big fan on which the words "Off" and "On" are clearly written.

211. There are, I understand, two main fans—one a pressure fan blowing the smoke into the bags, and then there is another fan over behind the main flue of the smelters, which sucks gases away off the filters?—I asked him to stop the fan which was turning the fumes into the baghouse. I was given to understand by the baghouse attendant that the fan was on and that was the cause of all the fumes and gas, so I asked Hughes if the fan could be stopped.

212. We will take it for the purpose of this examination that it was a pressure fan which you asked should be shut off; that is, the fan blowing fumes into the baghouse. How are the gases taken from the baghouse after they are filtered?—The only way I can see is that they have cone-shaped funnels on top of the baghouse, where at almost any time gas can be seen coming out from the top underneath those cone-shaped funnels.

213. How are the bags cleaned?—I have witnessed men who were baghouse attendants going into the chambers, and shaking them by pulling a wire. They went in with an electric light first. Then they would come out and pull a long wire which was through a hole in the wall.

214. Is it not a fact that those bags are shaken by mechanical means, so that there is no need to go in and shake them?—That is what is being done now. The old shaker-gear is pulled down and is not working now.

215. What are the bags made of?—Flannelette.

216. It is not flannel?—I cannot say definitely.

217. Is it not natural to suppose that with all that mechanical gear it is sometimes necessary to repair either in connection with mechanical fittings or the replacement of a bag?—If you wanted to replace a bag it is necessary to go into the baghouse.

218. It will be necessary at times to replace them?—Yes.

220. Did you not notice sections of the baghouse out of action from time to time?—I did.

221. Did this occur at regular intervals or irregular intervals?—I always found that the whole of the baghouse seemed to be stopped of a morning when I went into the works and the conditions were rather good. We did not get much effect from them. We got a little smell of the gas, but kept out of the way while that was going on and they were filling trucks. On this particular day that I was asked about when the Commission visited the works the fumes were rather bad. That was the day when there was more coughing and spluttering going on than I had seen there before.

222. What are the walls of the baghouse built of?—Brick.

223. Do they leak?—In several places.

224. In what parts?—Where the wire which is connected to the flannel bags comes through the wall there is a hole which is a lot too big for the wire. Another place of leaking is through the doors. The doors did not seem to close properly, especially at the bottom.

225. Is it not possible that the smoke on that particular day which you mentioned came from elsewhere, rather than from the baghouse, due possibly to change of wind between 11 a.m. and 3 p.m.?—Everyone of us there witnessed it quite clearly, and we mentioned it in conversation among ourselves. There was a broken door which had been leaking for at least a week. The hole in it was about 6in. wide and 9in. long. Smoke of a bluish color was coming through there.

226. The date on which the Commission visited the works was Tuesday, April 7th, and you say that the members of the Commission were in your vicinity at about 11.30 a.m.?—It was earlier than that.

227. It was some time between 9 a.m. and 12 noon?—Yes.

228. And you think smoke was put into the baghouse some little time after the Commission had gone?—Yes.

229. Do you know that it was put in?—Yes.

230. What was your evidence to that effect?—There was no

smoke when I first went there, and after the Commission had gone by about half an hour the smoke began to come through. We could both see and smell it.

231. Did the baghouse attendant tell you there had been any alteration in the arrangement for starting and stopping the fans?—He told me the fan was on.

232. Did he tell you that it had been put on?—I asked him what was the cause of the fumes, and he said, "The fan is on." I said, "What about shutting it off?" He replied, "I cannot; Mr. Hughes has told me to keep it on."

233. Did he say definitely that it had previously been off and had been put on?—I did not mention that. He said that he had to keep it on.

234. You cannot give us any proof that it was previously off when the Commission was there?—The only thing I can say is that there were no fumes or smoke there when I first went to work, which there would have been had the fan been working.

235. Is it not possible that there might have been a burst bag which would have caused the fumes, and the fan may have been on all the time?—It would have come through other chambers had one bag burst. I cannot say definitely how many bags there are in a chamber.

236. You do not know definitely that the fan was off when the Commission went there, but all you can say that, in your opinion, the smoke increased at a later time in the day?—Yes; there was no smoke at first.

237. You do not know that the fan was off in the earlier part of the day?—I never went to see whether it was on or off.

238. The inference which you made this morning, namely, that the fan was put on later in the day, was only supposition, and it may have been on all the time?—It may have, but if the fan had been off there would not have been any smoke.

239. Can you definitely prove to the Commission that the fan was off during the morning, and it was put on later in the day?—Not at present.

240. You mentioned the matter of masks, and stated that masks had been issued a few days after the Commission's visit. Do you know that those masks were a new type being issued for trial?—We were wearing two types. The type my mate and I wore was made of rubber with a sponge in it, and I should say it was an old type. The sailor gang, two members, were wearing what I should think would be a new type, made of a kind of metal, with gauze in front.

241. Those types were always available prior to the Commission's visit, were they not?—I think they were.

242. Have you ever asked for respirators yourself?—No.

243. You know that a respirator would be supplied if you requested it?—I think it would be.

244. You have never been refused the supply of a respirator?—No.

245. Do you know that the new type you said were issued three days after the Commission's visit are a special type, which it is thought may be an improvement on the respirators of other various types which have always been available?—They look a very good kind of respirator. I did not like the old type, but this new respirator should be good.

246. The possible inference from your previous evidence is that respirators were only issued as a new move by the company as a result of the Commission's visit?—I do not wish to mislead the Commission on that. I am not making any biased statements. The Commission is here for the purpose of getting evidence, and as a past worker at the smelters I am here to assist the Commission without any malice or bias.

247. The possible inference from your evidence is that respirators were issued three days after the Commission's visit, but that is incorrect, as other respirators were always available?—Yes.

248. You said you had been employed at the smelters for 14 months. Are you sure of that?—I made a rough statement when I said that. I am not in a position to go and get my papers from the smelters, and see on which days I worked and on which I did not work. I have to carry my mind back a year or more to the actual date when I joined the smelters. I should say it was, roughly, between a year and 14 months ago.

249. The records show that you joined on May 14th, 1924, and finished up on April 16th, 1925. That would be eleven months. You would take that as correct?—Yes.

250. Your absences from work have been due to various reasons previously dealt with, and not much to sickness?—Sometime it was sickness. On some days I stopped away not feeling fit to go into the works, but I did not go and pay 5s. to the doctor, and ask him to give me a certificate. I would go to work next morning, perhaps feeling a little better, and they would show on my ticket "A.W.L." On one occasion, I recollect sending a note down to say that I was sick, but "A.W.L." was entered in my book. Afterwards I had it altered and had "sick" substituted.

251. In that 11 months you worked in 11 different departments?—That is so.

252. You never kept one job long?—That is so.

253. Was that on account of the casual nature of your employment?—I suppose it could be put down to that, or that I come from Irish stock, who are known as wanderers throughout the world.

254. Do you remember how many times you were booked off?—No.

255. As there is a regulation that Britishers are to be given preference every time so long as a man is employable, you cannot give me any reason why you were booked off quite a number of times during this period?—On two occasions—when on the bottom floor and also in the Dwight & Lloyd—I was booked off for being absent without leave.

256. That is, you were absent without advising the office you could not come to work?—Exactly. In the sing pit, and also in the sample mill, I was booked off because those special branches did not have enough work in hand.

257. On April 16 you left before 5 o'clock?—Yes.

258. What time did you leave?—About 3 o'clock.

259. Why did you do that?—I was not feeling too good. The fumes were getting me, and I felt it.

260. What did you do after 3 o'clock?—I went up the road, but missed my bicycle. Somebody mentioned a name to me that I did not like, and I answered him with two fists instead of my tongue, with the result that the arm of the law took me and put me in a new boarding house for the night.

261. You did not happen to indulge in too much liquor during that period?—I had two drops of whisky. As a matter of fact, I am practically a teetotaller. Since that day I have not had a drink.

262. *By Mr. Robinette*—How many days did you work in the baghouse before the Commission came along?—About a fortnight. We had three days there when Mr. Tonkin came along and told us to get on to a more important job. Before the time the Commission made their visit I had worked there 14 days.

263. Did you ever notice any smoke there prior to that day?—Sometimes there was a little, but it would not last long. You could not say that you were being absolutely poisoned.

264. You worked there several days after the Commission went through?—Yes.

265. It was only on the day that the Commission was there that there was an abnormal quantity of smoke?—I came forward with my evidence because that was the day that I saw the smoke was increased.

266. *By Mr. Pearson*—I take it that if the fan were stopped for you and other people employed in the baghouse, the smoke had to escape somewhere?—Yes. It went up the big stack. For example, at noon to-day there was very little smoke going up the big stack, because it was then going into the baghouse.

267. If you people were getting preferential treatment because of the fan, would it affect employees in other parts of the works?—I believe it affects the top floor, and that the company loses a lot of smoke.

The witness withdrew.

HENRY ST. JOHN SOMERSET, general superintendent, Broken Hill Associated Smelters, Port Pirie, was recalled and further examined:

268. *By Mr. Gepp*—When you finished your previous evidence you were dealing with the Dwight & Lloyd plant and the improvements to it?—Yes. In addition to what I indicated, the front wall of the old building came down to within about 7ft. of the floor, and at one time of its operation the front was entirely closed in, except for doors, which were used as and when required to get to the discharge ends of the machines. In addition, on the old plant there was a crushing machine (a cracker) at the end of each machine—into which the discharge from that machine fell as it left the palettes. These crackers were always running while the machines were running, and they continued to make a considerable amount of dust at this point. They were hooded, but the hoods were not so effective, nor as big, as those on the present plant. When we were designing the new plant we kept the building as open as possible in order that any fumes or dust that did arise from the operations would have as much chance as possible of getting away. We removed the crackers from the ends of the machines, and now deliver the material from all the machines to one cracker situated at a little distance from the machine floor. In addition, the hoods over the ends of the discharging machines have been considerably improved, and lately there has been a modification made that we hope will do away with all trouble at this section, because it will enable the material discharging from the machines to be wetted evenly, which is not practicable at present when the material happens to be very hot.

269. Briefly, what is that suggested improvement?—It is an enclosed conveyor that is attached to the bottom of the hopper that receives the material discharged from the machine. Further, the wind boxes in which the dust, that is drawn through the roasting-bed by the suction fan, collects, are very much improved in the new Dwight & Lloyd plant compared with those that existed in the older plant. Furthermore, since we have had such a heavy increase in the reported lead cases we have tried a number of devices for diminishing dust at this point. It used to be one of the worst places on the Dwight and Lloyd plant, but we have now installed water-sprays inside the hopper-bin itself that have to a great extent overcome the trouble at this point. These have been operating for perhaps only three or four months. Further, the new Dwight and Lloyd plant was constructed in such a way that less labor is required around it than was the case in the old plant. That, I think, covers in the main the alterations to the Dwight and Lloyd section.

270. Have you mentioned anything about the watering-down of returns? Has that improved?—That applies generally around the whole works. Since we have been paying so much more regard to the matter, in consequence of the reported cases of lead poisoning, our instructions regarding wetting-down throughout the works, and particularly in regard to returned materials, have been much stricter. This is receiving considerably more attention than it used to.

271. Does your new Dwight & Lloyd plant compare well with those you saw on your tour last year?—It is easily the best Dwight & Lloyd plant I saw during the whole of my travels.

272. Will you describe the improvement you have made on the discharge from the Dwight & Lloyd cyclones, which, I understand, has been a great success?—Until comparatively recently the fine dust that is caught in the cyclones attached to each Dwight & Lloyd A machine was discharged periodically in a dry state through the bottom of the cyclone. This operation gave rise to a considerable amount of dusting during the short period that it was carried on. However, each of the cyclones is now equipped with a special device at the discharge end, by means of which the whole of the dust is thoroughly wetted, and now comes out in the form of a thick mud, and no dust at all exists at this point.

273. Is the watering down throughout this plant done under an organised programme?—Yes. It is done at least twice a shift. The watering down of the floors is done more frequently if the superintendent finds that, owing to special weather conditions, drying takes place more rapidly.

274. Has the new plant improved feeding devices which would eliminate the close supervision that was necessary for a good job with the old plant?—The construction of the plant is such that fewer men are required in and about the Dwight and Lloyd plant than were required before.

275. And is less attention required?—The attention required is not so close, because the job is a better mechanical one than the old job.

276. In regard to dust-trapping devices, have you made any improvements in the discharges of the Dwight & Lloyd plant?—As regards the A machines, I have already indicated that. I described in my evidence on the operation of the B machines that the discharges were hooded, and a draught was drawn up into them and through the working bed of the charge on the Dwight & Lloyd machine itself.

277. Have any improvements been made in regard to vacuum chambers?—I have also indicated that before in my description. I called them wind boxes.

278. In regard to the blast furnace department, are there notices everywhere on the top floor to the effect that the feed must be kept wet?—Not everywhere, but on those bins from which leady materials are drawn. For instance, the coke bin has no notice, nor the returned slag bin. The other bins have.

279. The instructions are definite that these notices must be carefully observed?—We do not rely on the notices, because we find that a number of men do not seem to even read them. We rely more on the instructions given by the foremen to the men that they take on to the jobs of charging, &c.

280. *By Mr. Robinette*—The notices are only written in the English language?—Yes; at this point.

281. *By Mr. Gepp*—Will you give us a general survey of the improvements that have been made in the blast furnace department since you have been in charge of the plant?—On the feed flood itself there are comparatively few changes made. The principal one is in the transfer of the feed cars from one side of the building to the other. This used to be effected under the control of men who were stationed one at each end of the building throughout their eight-hour shift. At present it is done mechanically, these men being eliminated, and there is thus less labor on the floor than there used to be. Very much more attention has been given to wetting down, both of the charge and of the working floor, than used to be the case a few years ago. This was done in consequence of the apparent increase in the leading cases throughout the works. On the bottom floor of the furnaces there have been considerable changes made. The principal one was the substitution of the slag granulating system for the old method of removing slag in double-bowled pots, drawn by horses. These pots were unsatisfactory, because, while they could be fairly effectively hooded immediately at the blast furnace, as they were being drawn away the driver was to a considerable extent exposed to the fumes that used to blow from the surface of the slag pot. Under the present conditions the slag runs into one pot that is hooded to catch the fumes, and from there through a short spout into the granulating launder. This has enabled us to much more effectively control the fumes at this point.

282. It becomes wet at the point where the water strikes it?—Yes.

283. From that point it is practically cold, and no fumes arise?—Yes. One of the furnaces is equipped at present with an improved device for drawing off the fume during the slag-tapping operation, and this is working excellently well, and orders are to equip the remaining furnaces as early as possible with this device. In connection with the running of the lead bullion to the moulds, fume and steam are given off by the lead before it cools. We have tried very many devices for overcoming the trouble at this point, but have not yet found a satisfactory one. In the course of a few months, however, possibly in one month, we shall have a different system of handling the molten bullion from the furnaces, which will admit

of our very effectively hooding the bullion running spouts, and so catching the fume that is now given off at this point.

284. There is a certain amount of by-products that used to be shovelled on the bottom floor at the blast furnaces. Has any improvement been made there?—Yes. It was the custom only a few years ago, perhaps three years, to return all refinery by-products, that is to say, the copper dross and the refinery furnace dross, to a point on the bottom floor of the furnace building and at the back of it. When they were needed for the furnace charge they were hand shovelled to small charge carts, and drawn by the men to lifts, hoisted to the feed floor, and tipped on the plates at the side of the furnaces, and then shovelled into the furnace. About three years ago, however, we arranged to have these drosses sent up by means of a hoist to a bin on the charge floor, from which they are delivered direct to the charging trucks, and trucked straight into the furnace. The old method of handling drosses is not entirely eliminated, because there are certain materials, such as antimony slag, that are still taken up by hand labor in these charge carts. This, however, is an intermittent operation, not a continuous one.

285. When was this mechanical charging scheme put in?—I do not know. It was before my time.

286. You would prefer to leave the matter of the improvement that that made to another witness?—I cannot speak definitely on it.

287. You can imagine how an improvement would be made from your experience in other directions?—I think it would be very probable.

288. You are using English coke?—Yes.

289. Why is that?—We use mostly English coke. We get a few hundred tons a week from New South Wales also. The reason is that the concentrate we are at present treating at Port Pirie is a difficult one to smelt, and while we have been improving our metallurgy in other respects, we found that the furnace work until comparatively recently, about 18 months ago, was not as good as we could wish. We had considerable difficulty in keeping the feed floors always clear of fume. We put a great deal of thought and experiment into the matter, got shipments of various classes of coke, and tried these out on the furnaces, and we ultimately came to the conclusion, which was proven very definitely, that Australian coke, with the exception of a small tonnage made in a special plant at Newcastle, was unsuited to the blast furnaces if the best results were to be had, and if the feed floor was to be kept as clear as practicable of fume. We were therefore forced to go to England for suitable supplies of coke. We are now using, with the exception of a small quantity from New South Wales, all English coke in the blast furnaces, and since we have been doing this the feed floor conditions are immensely improved. The first start to use more suitable coke was about 18 months ago.

290. There is considerably greater expense involved, I presume, in the purchase of English as compared with Australian coke?—It costs us considerably more per ton, not more than the New South Wales coke we are purchasing, but more than coke from the ordinary sources of supply in New South Wales, and considerably more than the coke which we were producing at our own coke plant in that State.

291. I am not sure whether you have mentioned the new bullion smelting plant, which is practically completed?—I have dealt with it, and mentioned that the Commission will probably see it in operation in a month or a little longer. It will not be on all the furnaces for practically five or six months.

292. Has anything been done in the refinery in your regime?—Yes; the main part of the refinery is precisely the same as when I joined the company's service, but we are giving more attention to the suppression of dust in the handling of the by-products that are made at this point, and there have been improvements in the method of delivering lead to the market lead kettle, whereby the formation of the considerable amount of dross that used to form at this point is now obviated. Further, we have evolved here a method of handling the silver crusts that come from the desilvering kettles whereby the retorting work and the subsequent cupelling work have been considerably decreased.

293. That is an achievement of your own research department?—That is so. As a matter of fact, it is a very considerable improvement, and one that has been troubling research departments of lead smelters for solution for many years. We have been the first people to solve the problem.

294. Are there any other important improvements which you have instituted in connection with the works generally?—I think the principal one is the appointment of a hygiene officer. This appointment was made about April, 1923.

295. What have you done in regard to the suppression of dust, &c., in roads throughout the plant?—Some few years back it was not the custom to water the roads down except at irregular intervals. But when we were faced with the realization that apparently the lead hazard was greater than we thought, we turned our attention to this problem among others, and divided the works area into a number of smaller areas. For the wetting-down of each the different departmental superintendents are responsible. The instructions are to keep down dust, irrespective of how much water is used or how long a time watering is carried on.

296. With regard to the litharge plant, you have well-considered and strict regulations?—Yes.

297. Those were put in some years ago?—Yes. A little before I joined the smelters the litharge plant was put into operation. None of us was familiar with the method of manufacture, and we had a few lead poisoning cases coming from the small number of employees at that point. We therefore made considerable improvements in the enclosing of the working parts of the litharge mill, and instituted a set of rules with regard to the wearing of overalls, caps, gloves, and respirators by the men working in the inner room of the litharge mill. Further, the men who are engaged on packing have a definite task to do. That is to say, they either empty a bin of the amount of litharge crushed, or else they have a maximum given number of tins, and when these are done they are at liberty to go to the bathroom, bathe, change, and go home.

298. What has been done in the last few years regarding crib-houses and so forth?—It is now some years since the first of the crib-houses was put in, but at present we have crib-houses attached to the various departments throughout the works. In these crib-houses there are washing basins, and there is also a hot-water supply, where the men can get the requisite water for making tea and so on. The crib-houses are under the care of an attendant, whose duty it is to see that they are kept clean and in decent order for the men to use them.

299. What arrangements are made throughout the work for the supply of drinking water?—In special little houses drinking fountains are installed in various places throughout the works. These drinking fountains are built so that the water from the ordinary town supply passes under the town pressure through a filter of special fibrous material, and after filtering it goes through a metal coil that passes into the ice chamber of an ice-chest standing alongside, and from this comes out to an ordinary jet drinking fountain such as are used in various towns in Australia. Naturally, the ice is only used during the hotter weather.

300. Have you a change-house in the plant?—Yes; we have a modern change-house built outside the gate through which practically all the men leaving the works pass.

301. Is it equipped with lockers, sanitary appliances, etc.?—Yes; it is equipped with lockers, washing-trough basins, with hot and cold water, and shower-baths with both hot and cold water available. There is also a sanitary system on the septic tank principle.

302. What arrangement have you for drying clothing if the men wish that done?—There is a drying-room which is operated under the care of the change-house attendant.

303. With regard to respirators in places where dust may

be unavoidable temporarily or where a man is working, what arrangements are made by the company?—Respirators are available throughout the works for any men who care to use them, but we find it difficult to induce the men to use them in many instances.

304. You have a first aid department?—Yes; there is a first aid department, with a properly qualified man in charge on each shift.

305. When Dr. Robertson was here as your works doctor he recommended that there should be made available effervescent fruit salts. Is that still carried out?—Yes; they are made available in the first aid department, or from foreman in each department, for anyone who cares to take them.

306. You have a notice published in the works?—Yes.

307. Will you produce a copy of it?—Yes. [Copies produced in different European languages and marked Exhibit 1.]

308. What is the purpose of this notice?—To try to induce the employees to give sufficient care to themselves, in order to obviate as far as possible the hazard of lead poisoning.

309. Would you like to make any alterations provided it were possible to enforce these alterations?—Yes. The first rule might be altered to say that the hands and face must be well washed clean before food is eaten. The second one might read that smoking is absolutely prohibited. I would like to see it compulsory that men change their clothes on entering and leaving the works.

310. *By Mr. Robinette*—Provided that there is adequate provision to do so?—Quite, and that they make full use of the change-house. I would like to say that in making these recommendations I am guided very largely by literature I have read on the subject, and by what has been adopted in regulations in certain of the European countries and in England.

311. *By Mr. Gepp*—Is there not a very strong recommendation in the volume by Legge and Goadby in regard to meals before coming to work?—Yes; they state that no man should come to work unless he has had a decent meal before he does so, and that coming to work with an empty stomach increases the liability to leading.

312. What suggestion would you like to make as regards respirators?—I would like to see a clause framed making the use of respirators compulsory in places where they are considered advisable by the works doctor.

313. *By Mr. Robinette*—Who is the works doctor?—There is none at present.

314. Are you anticipating engaging one?—I hope so.

315. *By Mr. Gepp*—Do you think that the men would fall in voluntary with the rules you mention?—No.

316. Smoking, for example?—I think they would raise very strenuous objections, because they would consider it an interference with customs that have been established a long time on the plant.

317. You believe that the alterations you suggest would make for improvement?—Yes.

318. What leads you to that opinion?—Ordinary common sense firstly, and secondly, the opinion of the authorities on the subject I have read.

319. The British regulations say something specific about the matter, do they not?—Yes; I refer the Commission to the British regulations, pages 147 and 148, summary of Gilbert Stone. [319A.] Dr. Oliver, a British authority, also deals with the same matter?—Yes; but I have not got his book here.

320. Are there any other means calculated to improve the health position now being installed?—Yes.

321. Will you give the Commission a general idea of some of them?—At present the baghouse that is taking the smelter fume is equipped with two fans, one of which drives the fume into the bags inside the baghouse. The other draws the filtered gas off, and discharges it into the main smelter stack. This arrangement has been in operation only a comparatively short time, and we now find that the fan drawing the filtered gas from the baghouse is hardly big enough for its work, with the result that there is a slight pressure inside the baghouse, and this pressure causes a leakage of gas through any crevices that exist in the structure. We have ordered a larger fan to replace this suction fan, and when it is installed the whole of the trouble that now comes from the fumes escaping in the baghouse should cease. In addition we are building a baghouse to take the whole of the smoke from the A section of the Dwight & Lloyd plant. This baghouse is about half completed. Further, approval has been granted and the work started on the construction of another baghouse that will take all the fume from the B section of the Dwight & Lloyd plant. The filtering of the Dwight & Lloyd gases has been the result of considerable experiment in various parts of the world, and has always presented very considerable difficulty. Five or six years ago we were operating an experimental baghouse that was taking the fume from one machine of the Dwight & Lloyd plant. We were unsuccessful in operating this machine continuously, due to the heavy condensation of moisture on the bags and the consequent difficulty in keeping the bags strong enough to stand the pressure.

322. You mean due to the condensation of acid mist?—And water.

323. The diminution in strength was due to a slight trace of acid in the moisture condensing?—Yes. Part of my mission on my recent visit to the United States of America was to go as closely as practicable into the methods of handling this fume at the various smelters in that country. I found that it had caused them all a lot of trouble. Some of them had got over it by mixing the roaster fume and blast furnace fume together. Others had installed various devices with indifferent success, and they finally came to the conclusion that probably the best way to handle the material was to pass it into baghouses, and so to arrange the baghouses and devices leading to them that the temperature of the gases could be kept up to a point where the moisture could not condense, and the gases would still be sufficiently cool to make the bags safe. At two plants particularly in the U.S.A. they had given up temporarily the treatment of the fume, because they had found that their baghouses were being set on fire continually. However, I think we have discovered the reason for that, and that the danger will not exist in our installation.

324. Was not a baghouse erected with the early Dwight and Lloyd plant?—That was the one I was speaking of just now.

325. You have dealt with the improvements you anticipate putting in on the Dwight & Lloyd gases. Have you any hope of eliminating the Huntington-Heberlein section?—A very considerable hope. As a matter of fact, the amount of sinter being made in the Huntington-Heberlein section now is just about half of what it was a year ago, and the improvements that we are making on the B section of the Dwight & Lloyd machines will, I think, result in the shutting down of the Huntington-Heberlein plant. On this point I am not certain, as, of course, metallurgical considerations must enter into the matter.

326. You will make every endeavor to eliminate this Huntington-Heberlein section?—It will certainly be reduced and probably eliminated. As far as the metallurgical efficiency of blast furnaces is concerned, the Huntington-Heberlein material is very much better than the Dwight & Lloyd material. It is only health considerations that prompt us to try to cut it out.

327. Are any further measures contemplated. For example, have you any intention of improving your refinery?—I cannot say definitely that there is a certainty of the present refinery going out of commission, but I think that that is very probable, and that a new refinery will be put up. In this new refinery we would pay full attention to ventilation and all those points that could possibly affect the health of the employees.

328. Does the new system you contemplate indicate a healthful operation?—Two processes are being considered. The one that you refer to has hardly been fully proven, but if it proves successful in the plants in which it is operating now, and we put it in here, all danger of lead poisoning from the refining section, with the exception of the retorts and cupels, would disappear absolutely.

329. A decision on this may be expected shortly?—Within six months.

330. I presume there is a studied attack on the whole question of improving all mechanical handling on the job, such as conveyor systems and so on, from the standpoint of dust?—We are always trying to improve working conditions, and at the same time endeavoring to improve mechanical appliances on the job. In any case whenever anything new is contemplated we pay the greatest attention to the working conditions that will result if the change is made.

331. If you have to keep some of your Huntington-Heberlein section going, have you any scheme to improve the operation?—Yes. If, as I think we can, we can reduce the Huntington-Heberlein material for sintering to a smaller volume than at present, then I think it would be practicable to allow the material to remain in the pots for some hours after the operation was finished, and to continue blowing air through it so that it would be cooled down, and it would be possible to wet it thoroughly before the tipping operation was performed.

332. Regarding your change-house accommodation, I presume you will increase that as you find any indication of the necessity therefor?—Yes. The present change-house is one section of a larger contemplated change-house, and the wall is so constructed that other sections can be built on as required. The reason we have not increased the change-house capacity is because we find it difficult to induce the men to use it. It is not now being used to its full capacity. When we see any need for the new one, and if we can arrange that the employees will use it, we will be only too pleased to make the change without delay, irrespective of expense.

333. I understand that a discussion is going on regarding a dental clinic?—Yes. At present we are discussing with our employees the advisability of constituting a dental clinic following closely on the lines of the one operating so successfully at Risdon. The company is greatly in favor of it, because we think that possibly much of the sickness existing on the works is due to the poor condition of the teeth of a number of the operatives. The executive of the Co-operative Council is now discussing with the employees their ideas in the matter, and we hope in a very short time, probably in a week, to have some definte indication of the employees' desires in the matter. I greatly hope they will be in favor of a dental clinic, because a clinic could do nothing but good.

The Commission adjourned.

Thursday, April 30th, 1925, at 10 a.m.

[At Congregational Hall, Port Pirie.]

Present—

Dr. K. R. Moore (Chairman).
Mr. H. W. Gepp.
Mr. J. L. Pearson.
Mr. W. Robinette.

HENRY ST. JOHN SOMERSET, general superintendent, Broken Hill Associated Smelters, was recalled and further examined:

334. *By Mr. Gepp*—Before the adjournment yesterday you were dealing with further contemplated measures, and we had reached the subject of a dental clinic. Are there any other points you wish to mention in that connection?—I think I have covered practically the whole of that ground.

335. Will not these things call for large financial outlay?—Yes; very large.

336. Do you, as general superintendent, experience any difficulty in securing authorisation of necessary expenditure to improve conditions in the plant?—I have no difficulty whatever where health is concerned.

337. The board approves of these matters withour demur and without delay?—That is so.

338. Having regard to the work necessary to be done to keep the plant operating, have these plans for improvement been put into effect with all reasonable expedition?—Yes. Of course, some of them have taken considerable time to put into operation, but that has been due to the fact that we have suffered very often from a shortage of certain classes of tradesmen.

339. In the designing of your new plant, is special consideration given to the question of the protection of the operating conditons from the standpoint of health?—Yes; it is always given the greatest possible consideration.

340. Yesterday you put in a number of tables, marked C, D, E, F, G, H, K, and L (Exhibit 2), and we dealt in detail with Table C. Will you now please explain to us Table D?—This table deals with an analysis of the reported case of lead poisoning, having regard to length of service in relation to nationality, and covers the period 28/6/17 to 11/3/25. You will notice that up to a period of 120 months the headings are given in months. Those are the periods during which a man was absent from work covered by doctor's certificate and receiving compensation. Then you will see a heading "over 10 and up to 15." That and the subsequent ones are years of service in relation to nationality. Of course, these only deal with cases that have been certified as lead cases. If you take the British section you will see that up to three months of service there have been 12 cases of reported lead poisoning. Those 12 cases are 4.72 per cent. of the total British lead cases reported, and the figure 54.55 means that those 12 British cases represent 54.55 per cent. of the total cases of all nationalities that have had a lead poisoning history with up to three months' service, the total being 22 cases. Under the heading "over 10 and up to 15 years" there have been 23 cases of British workmen who have been certified as lead poisoning cases. These 23 cases represent 9.05 per cent. of the total Brtish cases reported during those eight years. They further represent 79.31 per cent. of the cases of all nationalities reported as lead cases, and having a service of over 10 and up to 15 years. The total number of cases reported, including all nationalities, with over 10 years' service and up to 15 years service, is shown at the bottom of the column as 29 cases. It represents 6.76 per cent. of all the lead cases reported during those eight years.

341. The lengthy line of months and years is the period of service?—The headings relate to the period of service, up to three months' service, four to six months' service, and so on.

342. This table is not dealing in any way with the period of disability?—No.

343. A number of those cases may have been only a week or a fortnight?—That is so.

344. But this table does not show that?—It does not deal with that at all, but is simply to show in a definite period of service how many cases of leading occurred, and how they were divided into different nationalities.

345. In a great number of cases those men may have been on compensation for a week, a month, or three months, and then in many instances have returned to the works again and carried on?—Yes; and some of them would appear twice. It is quite possible that the men who appear in the period 25 to 28 months also appear in the period 73 to 96 months. In the case of Greeks reported as suffering from lead poisoning, and having a period of service between seven and nine months, both inclusive, we had seven reported cases of lead poisoning. These represented 9.72 per cent. of the total Greek cases reported during the eight years. These cases further represented 20 per cent. of the total number of cases of all nationalities having a period of service of seven to nine months when their disability arose. You will understand that the period seven to nine months does not include four to six months. It is a specific period in itself. In the case of Maltese having a period of service of 19 to 24 months there were 10 cases certified as plumbism. These 10 cases represented 27.02 per cent. of the 37 lead cases of people of Maltese nationality that occurred during the eight years. They further represented 27.03 per cent. of all cases of all nationalities that occurred in men having a period of service of 19 to 24 months. It is evident from

this table that the period of service of the Maltese is comparatively short.

346. Is there any general indication you can give the Commission as the result of a study of this table?—If the cases reported are genuine it definitely appears that the foreigners are more susceptible to lead poisoning, that is to say, a greater percentage of them suffer from plumbism in the earlier months of their service.

347-9. A very large number of the cases are of short service men, and a large number of the short service men are southern Europeans?—Yes.

350. We wish you now to deal with Table E?—Table E sets out the lead poisoning statistics having regard to the length of disabiltiy in relation to departments of origin of the contraction of the disease, and covers a period from 28/6/17 to 11/3/25. The main heading shows the weeks of disability, and is divided into four weeks and under, five to 13 weeks inclusive, 14 to 26 weeks inclusive, and so on, until the final heading is 105 weeks and over. The other main heading gives the departments and the works divided up as far as possible. The table has the most careful regard to the statistics available in the plant, that is to say, if a case is given as a refinery case it is the case of a man who was working in the refinery at the time he was certified as being lead poisoned. It does not follow that that man had worked all his time in the refinery. He may have worked in other sections of the plant at different times. We had to take some starting point, so we took the point that the cases certified from a department had their origin in that department. If you take the refinery you will see that the number of cases of disability of four weeks and under total 20. These represent 21.98 per cent. of all the cases coming from the refinery, which were 91. They further represent 20.84 per cent. of all the cases showing four weeks and under disability that have occurred or been certified on nthe whole works, which were 96 cases.

351. I gather from the table that there were 91 cases in the refinery for the eight years of reported cases?—Yes.

352. There were 58 cases on the top floor and so on?—Yes.

353. Taking that first column, you had 96 cases of four weeks and under of disability?—Yes.

354. You show 106 cases of five to 13 weeks disability and 49 cases of 14 to 26 weeks?—Yes.

355. *By Mr. Robinette*—Take the 105 weeks. How do you arrive at that?—That is for two years.

356. How do you arrive at those figures? Do you include the men that have been compounded or actually working?—We could not include the men who have left the place.

357. *By Mr. Gepp*—All the compounded cases are included? Yes, but I shall supply the information Mr. Robinette desires later.

358. Am I right in saying that 96 plus 106, or a total of 202 cases, which represent approximately 47 per cent of the total number of cases, are cases that have been under 13 weeks of disability?—Yes.

359. Will you explain Table F?—It deals with statistics relating to certified cases of lead poisoning, having regard to the length of disability in relation to length of service, and covers a period from 28/6/17 to 11/3/25.

360. What is just the difference between Table E and Table F?—Table E dealt with length of disability in relation to the department of origin of contraction of disease. Table F is length of disability in relation to length of service, irrespective of what department the man was working in at the time he contracted the disease.

361. Can you from this table make the same point, namely, that nearly 50 per cent. of the cases are under 13 weeks of disability?—A study of the table will show that 47.09 per cent. of the total cases of reported plumbism have a length of disability of 13 weeks and under. Now, take the period up to four weeks of disability. The figures given under the heading "weeks" relate to the length of disability. Taking the "up to four weeks" disability and the period 10-12 months, there were seven cases having a disability of up to four weeks that occurred in men who had a length of service of 10-12 months inclusive. These seven cases represented 7.29 per cent. of the total cases that had disability up to four weeks. They further represented 28.00 per cent. of all the cases that occurred among the men that had 10-12 months' service irrespective of the period of disability. Table G deals with the statistics of certified cases of lead poisoning, having regard to the length of disability in relation to nationality, and covers the period 28/6/17 to 11/3/25. The main heading is "Weeks of disability," divided, as in the other cases, into "Four weeks, 5-13 weeks," and so on; and the other main heading is the "nationality" of the various reported sufferers from plumbism. Taking the British, the first figure shows 59 cases with a period of disability of under four weeks out of a total number of British cases of 254.

362. That number, 254 is large compared with the individual totals of foreigners. Is that due to the fact that during the earlier years of this eight year period, you had comparatively few foreigners employed?—For the greater part of the eight years that is so.

363. If these figures had been taken out for the last two years the percentages would have been very different?—Yes. Those 59 cases represented 23.23 per cent. of all the British cases. They further represented 61.46 per cent. of all the cases having a disability of under four weeks, irrespective of nationality.

364. May I take it that in regard to this table the shorter period during which foreigners have been employed in large numbers, makes a comparison with the British figures rather impossible?—You cannot make a direct comparison because the greater number of the foreigners are of comparatively short service, whilst a large proportion of the Britishers are long service men.

365. Except in special cases, the weeks of disability among the longer periods of service, would not apply to foreigners at all, because you have few foreigners who have been employed for over five years?—That is so. Taking the Maltese section under the heading "5-13 weeks" of disability, there were 12 Maltese cases certified as plumbism. Those 12 cases represented 32.43 per cent. of all the Maltese cases. They further represented 11.32 per cent. of all the cases of plumbism having a disability period of from five to 13 weeks, and including all nationalities.

366. Will your percentage of Maltese employed at the works be shown on any other table against disabilities?—Yes. Table L covers all these statistics.

367. The number employed is comparatively small?—Yes. There are about 96 at present.

368. Will the same point, in regard to compound cases, that you have referred to the office for information in regard to other tables, apply to this table also?—I think so. Table H sets out the statistics regarding certain cases of lead poisoning, having regard to the ages of persons compensated during the period 28/6/17 to 11/3/25 in relation to nationalities. The main heading gives the ages in years of the various certified cases, subdivided into headings, "21 years and under," "22-25," and so on up to the final heading "over 60 years old." The other heading simply gives the nationalities sectionalised. Taking the British cases under the heading "21 years and under," there were seven cases of Britishers certified as lead poisoning who were 21 years old or under at the time the certification was made. These seven cases represented 2.76 per cent. of all the British cases. They further represented 77.78 of all the cases (nine) where certification had been given to persons 21 years old or under, irrespective of nationality. It is evident that the British proportion would be heavy in that section, because comparatively few foreigners of that age would come out here.

369. This table shows the greater number of cases between the ages of 25 and 40, which is the general working age?—There is a bigger percentage of workmen between those ages.

370. Is there any special point brought out by this table?—I do not at the moment recall anything particularly striking in it.

371. It has been prepared, I presume, in order to assist the Commission to ascertain whether any particular age is susceptible?—Yes.

372. It will have to be taken into consideration with all the other facts when the Commission consider the matter in detail?—I presume that would be so.

373. Table K deals in another way with the same question of age in relation to disability?—Yes, but it is not divided into nationalities. That is the only difference. Table K deals with the statistics regarding certified cases of lead poisoning, having regard to the ages of the persons contracting it in relation to the length of disability. This table does not divide the certified cases under the heading of nationalities; but in the series, for instance, up to 21 years of age, all cases are included irrespective of nationality. Those cases under that heading having four weeks and under of disability number two. Those two cases represented 22.22 per cent. of all the cases certified as regards persons 21 years old or under, the total number of cases under that heading being nine. They further represent 2.08 per cent. of all the cases that had a period of disability of four weeks or under.

374. The last column shows again that there is not any particular age, remembering always that these tables are all complicated by the introduction of Southern European labor during the past two years?—That is so.

375. To make absolutely certain of that you would have to have a very clear analysis?—Yes. I further think that a layman could not do it even in that case. All sorts of factors would enter in.

376. Table L gives a summary of all reported cases, and brings together in one sheet the conclusions indicated in all the detail sheets?—That is practically so. It is not practicable to put everything in.

377. Will you explain the main object of this sheet?—It is to set before the Commission in as clear a form as possible as much as possible of the information we have regarding reported cases of plumbism. That is to say, it is much easier to take the main features from one sheet than to have to search among a number of them for information.

378. Will you bring out any points from this summary to which you desire to draw the attention of the Commission?—The table deals with the certified cases of plumbism occurring between the period 28/6/17 to 31/12/24. You will see that it is taken in half-yearly periods, and consequently it has not been practicable to carry it further than the end of 1924. You will note very clearly from the summary at the top that there was comparatively very little reported plumbism until the early part of 1922, and from that period on the cases have grown very rapidly each half-year until in the half-year there were 131 reported cases.

379. Will you explain what are the first, second, and third lines in the summary at the top of the table?—The first line in the summary is the total number of individuals employed during the half-year ended as indicated.

380. That, I presume, is the turnover?—Yes; for the first four years those figures were not available, but since then, in the half-year ended 23/12/19, for instance, you find the total number of persons who had employment during that period, irrespective of whether they worked one day or the whole half-year. It is the labor turnover.

381. What is the second line?—The total number of lead cases during the half-year, that is, the certified cases of plumbism, that came in to us, and were compensated during each of those half-years. The third line is the total of lead cases as a percentage on the total number of men employed during the half-year; that is, of course, the total employed, not the total in average employment. You will see that those percentages get very much heavier during the latter part of the table.

382. Take the average percentage and illustrate to us the figures of the same percentages in respect to the different nationalities?—In the earlier half-years there is practically nothing.

383. Britishers, for instance, rise from .15 per cent. in 1919 to 1.46 in 1922?—Those figures are the percentages of certified lead cases in the total number of British persons employed during the individual half-year to which they refer.

384. What about the foreigners?—Taken as a group they rise from 1.333 in the half-year ended 22/6/21 to 9.133 per cent. in the half-year ended 31/12/24. That is the percentage of lead cases of foreigners on the total number of foreigners employed during that half-year.

385. It shows a sudden jump in 12 months from under 3 per cent. to over 9 per cent.?—Yes; a very sudden jump.

386. Let us consider the Maltese?—The percentage of lead cases of Maltese employed during the half-year ended 20/6/23, the first figure that appears, was .909 per cent. of the Maltese employed during that half-year. The next figure appears under the heading 2/7/24. For that half-year 2.919 per cent. of the Maltese employed were returned as certified lead cases. For the last half-year shown, that is the period ended 31/12/24, 25 per cent. of the Maltese were returned as certified lead cases.

387. During the period you have just mentioned the number of Maltese employed has not varied at all from the point of view of this question?—From the first half of 1923 to the present time the numbers have varied between 110 and 137. For the half-year just ended there were 96.

388. That is to say, during the period when these heavy percentages have occurred Maltese have been employed to the extent of about 100 men, as against less than 50 men during the period prior to 1923?—That is so. I would like to point out that up to the period 20/12/22, although we had in some cases fully 50 per cent. of the Maltese employed that we have at the present time, there were no reported cass at all from them, and at that time the condition of the works was undoubtedly not so good.

389. The compensation has not varied considerably until the beginning of this year?—No. The new Act came into force on January 15th, 1925.

390. What are the compensation amounts payable under the present Act?—Fifty per cent. of the average weekly earnings, plus 7s. 6d. per week for each dependent child under the age of 14 years, with a maximum payment of £5 per week.

391. What is the compensation for permanent and total incapacity?—£700.

392. Does that mean inability to work at all or inability to work in this industry?—That is a point on which the certificates are not very clear.

393. We may take it for the time being that when a certificate is given for permanent and total incapacity it means that a man should not work in the industry again?—It may mean only that or more than that. I do not know.

394. When did the original Act come into force?—In 1911.

395. Can you give figures for payment in respect of so-called permanent incapacity since then up to date?—In 1911 the amount for permanent and total incapacity was £300. In 1918 an amendment raised this to £400. In 1919 it was raised again to £500, and in 1924 to £700.

396. Does the extraordinary percentage of cases among foreigners apply generally? Is there a great difference between the percentage of foreigners and that of British?—Southern Europeans, yes; other foreigners, no.

397. The first record appear under the heading 19/12/23, when 6.25 per cent. of the Germans employed during that half-year were certified as lead poisoned?—Yes. In the following half-year 6.061 were certified, and in the half-year ended 31/12/24 4.167 per cent., so that in the case of the Germans the percentage has slightly decreased.

398. Take the Scandinavians?—The percentage of certified lead cases of Scandinavian nationality figured on the total number of Scandinavians employed during the respective half-years shows that the first record is under the half-year 22/6/21, when 5.555 per cent. of the Scandinavians employed during that period were certified as plumbism cases. There were only 18 Scandinavians employed during that half-year. The next record appears when there were 21 employed, with a percentage of

4.762, there being only one case. Next is under the heading 20/6/23. There were 24 employed, and two cases, representing 8.333 per cent. In the period ended 2/7/24 there were 40 employees and one case, the percentage being 2.5. In the half-year ended 31/12/24 there were 54 Scandinavian employees and two cases, and the percentage was 3.704, so it can be seen that just as in the case of the Germans, instead of rising heavily, as in the case of foreigners generally, the percentage of certified cases on the men employed during the latter half-years decreased among the Scandinavians.

399. As a comparison, please give us the Russian?—The Russians are another section comprising a very small number of employees, smaller even than Scandinavians. The first record in respect to certified plumbism appears under the half year ended 21/6/22, when there were 14 Russian employees, two of whom were certified as suffering from lead, the percentage being 14.286. The next record appears under the half-year 2/7/24, when there were 25 Russians employed, and two certified cases, representing 8 per cent. The next record is under 31/12/24, when there were 29 Russian employees and four cases, and the percentage was 13.793, so that in the case of the Russians there has been practically an average number carried forward.

400. The Italian have risen, I see, from 1.4 per cent. in 1922, to approximately 10 per cent. in 1924?—Yes; 9½ per cent. for 1924.

401. Generally speaking, this table indicates that Southern Europeans generally have shown a very considerable increase in cases of plumbism, and a number of the northern races have rather decreased, also that Britishers, having increased up to a maximum in the first half of 1924, have not increased since?—That is so.

402. What arrangement, if any, have you made for the special study of health matters by your staff?—In April, 923, we appointed an officer to give special attention to this department, that is, the department of industrial hygene.

403. Who is the officer now performing those duties?—Mr. George Dey.

404. What is the general nature of the instructions under which he operates?—He was instructed that he was to take under his supervision all these matters that related to the safeguarding of the health of the employees in all departments of the works.

405. Those instructions have been amplified from time to time?—Yes.

406. Mr. Dey's work would cover all things under the heading of hygiene and health hazard?—Yes. He has those matters under his supervision. Mr. Dey has not held always the full authority that he now has during the term of his appointment.

407. Has he any other duties at present but those of industrial hygiene officer?—No.

408. Are your works inspected from time to time by Government officials?—Yes. The officials of the Mines Department and of the Factories Department inspect them.

409. You, of course, have always followed out the suggestions of those officers when offered?—Yes.

410. When you were inspecting plants abroad, did you find anywhere that a medical service was part of the organisation?—Yes. There is a medical officer employed by the company at the Herculaneum smelter at St. Louis. Several of the smelters of the American Smelting and Refining Company have doctors as members of their staffs, and the Burma Corporation smelter employs three doctors to oversee the health of their employees.

411. How many men are employed by the Burma Company?—Roughly, about 5,000.

412. You were in full touch with the general manager and all his staff when you visited Burma?—Yes.

413. They gave you full information regarding all their operations?—Yes.

414. What did the general manager and his staff tell you about the effect of such services?—On my trip generally I was very much interested in the lead poisoning side of lead smelting, and I made close enquiry at all smelters as to the extent in which it existed and as to how they combated or attempted to combat lead poisoning. At Burma, I was told by each of the three medical officers that there was practically no lead poisoning. Apart from the fact that I took the doctors to be perfectly honest men the company had no object in hiding any such cases, if they existed, because they are under no liability to compensation or penalty whatever in regard to the matter.

415. The doctors told you that, by their study of the working conditions and their examination and treatment of the employees and by their instructions to the employees in health directions, the effect had been excellent. The management informed me particularly that the doctors co-operated with the operating staff in the endeavor to improve the working conditions throughout the plant.

416. You mentioned that the American Smelting and Refining Company have doctors on the staffs of their organisations. Do they regard them as an essential part of their organisation?—They informed me that they regarded the doctors as an essential part of their organisation. They thought they derived very great benefit from the employment of these doctors.

417. *By Mr. Robinette*—Does a Compensation Act apply there?—Only in two States. They have smelters in those two States. I did not have an opportunity of speaking to two doctors mentioned to me as employes of the American Smelting and Refining Company, but I spoke to several of the vice-presidents and mining engineers and managers and metallurgists on the plants that I visited.

418. You were in very close touch with the heads and with the chiefs of staffs of all the big smelters in America?—Yes. I had close and cordial relations with them, due to the fact that we had interesting information to exchange.

419. They were very open?—They appeared to be entirely open in the matter, and I particularly questioned them as to the prevalence or otherwise of lead poisoning at the various smelters, because the conditions as I saw them in the smelters generally were at least no better than those existing at Port Pirie; in fact, in many cases, they were a good deal worse. I was told, without exception, that the cases of lead poisoning were comparatively few, that is, just two or three a year.

420. Did they indicate in any way the effect of prohibition upon the position, having regard to the labor and health of the men employed?—In practically every case I was told that this greater immunity from lead poisoning came with the introduction of prohibition in the United States.

421. The evidence generally you have read from time to time in regard to the effect of alcohol upon men employed in an industry such as this, I believe, that excess in this or in other directions is harmful?—Yes. The authorities seem unanimous that alcohol, taken in excess, renders any man more susceptible to plumbism than he would otherwise be.

422. Have you ever thought of the advisability of appointing a works doctor?—Yes.

423. What steps did you take?—In 1920 we actually appointed a doctor to act as works doctor, and to assist in safeguarding the health of the employes by periodic examination of all employes.

424. What was the doctor's name?—Dr. D. G. Robertson. He was especially appointed because he had had considerable experience in industrial hygiene.

425. What were the duties it was decided the doctor should perform?—It was our desire that in the first place he should make periodic examinations of all employes, including the staff, with the object of protecting their health so far as was practicable, not only from industrial disease but to advise them in all matters regarding their health and to co-operate fully with the operative staff in the endeavour to improve the working conditions generally throughout the plant.

426. Is Dr. Robertson still with you?—No.

427. Why not?—Because our action in this regard met with such strenuous opposition from some of the unions that we

were forced to cancel the arrangement we had made with Dr. Robertson after he had been with us only six months.

428. Was any explanation offered as to the attitude of the unions in this matter?—Yes. The representatives of the unions told me that they objected to medical examination, periodic and compulsory, and that they thought further that the results of Dr. Robertson's examinations, being available for the general superintendent, he might use those results unjustly, and perhaps dismiss men whom it was shown had an incipient industrial disease.

429. Do you consider this attitude justified?—No. I think it was unreasonable, and that the unions had no reason to believe that the company would act unjustly. On the contrary, I think that the company's record with its employees shows that it has always endeavored to act fairly and justly with them. Further, I think the unions should have recognised that unless we had available information we could have got through Dr. Robertson's examinations we would be very much less able to improve the health hazard position than we otherwse would be.

430. Do you consider it important that a doctor should be appointed to specialise in hygiene in your works, and in improving the general health of your employees?—Yes. I still consider it is important, and I am quite certain that the company is still willing to make such an appointment. Without such help from a qualified medical man we are placed at a grave disadvantage in attempting to maintain or improve the health conditions throughout the works. It is a very common practice in England and Europe for big organisations such as ours to carry as a regular part of their operating staff a qualified doctor, who endeavors in every way to safeguard the health of the operatives employed.

431. You would, therefore, welcome the hearty co-operation of all employees in this matter?—Certainly.

432. You are aware that one of the functions of this Commission is to recommend measures for the elimination or alleviation of plumbism at the smelters. Can you offer the Commission any constructive proposals in this direction?—Yes. In the first place I consider that it is eminently desirable that all applicants for work at the smelters should undergo a thorough examination by a competent doctor to determine whether or not they are suitable for employment in this industry.

433. Do not they do that now?—I think the examination should be more searching than it is now. Further, I think it should be competent for the company to have a doctor, who would make an examination of all employees, perhaps, after they had been a month in the company's service. I think this is particularly desirable, as if we were unable to get the information that would be available in that way the men might go on acquiring lead poisoning, and no one would be any the wiser.

434. *By Mr. Gepp*—You would desire to have the men's co-operation in trying to eliminate the susceptible stage when there is danger to the susceptible?—Yes.

435. In regard to the periodical examination of all operators and men directly connected with the production, have you anything to say?—I think that should be made at such periods as the works doctor sets out, having regard to the places and conditions under which different operatives are working. He might consider it desirable to examine monthly in some places, three monthly in others, and six monthly in others, according as he considered the risk greater or less.

436. Further, that he would examine all employees, including those not connected with the actual operations, at longer intervals, as he might decide?—He would examine all employees, including the staff, from the health hazard point of view.

437. Would the examination, in your opinion, cover all questions of sickness or possible sickness, in addition to protection against plumbism?—Yes; to this extent, that our instructions to Dr. Robertson were that where his examination showed that medical attention was necessary, he would advise the man he was examining that he had better go to his doctor, and also state that if that doctor desired to have the result of Dr. Robertson's examination he would be glad to collaborate with him. I would not at present take it that the works doctor's duties would extend to the general treatment of all employees, except as regards advice, and possibly medicine delivered at the works to those who might be contracting industrial disease.

438. He would act as adviser to all employees, and tell them to be careful in regard to certain points of diet or habits?—Yes, and further, would advise them when he thought it necessary to go to their own doctor for specific treatment.

439. If this work proved to be too much for one medical man, would your company be prepared to call in further permanent assistance?—I have no doubt they would.

440. You would hope in this way to get definitely the development of methods by which early lead absorption could be recognised?—That would be one of the objectives. We would hope to be able, by specific treatment, perhaps, to arrest lead poisoning when it began to show itself, or perhaps under the doctor's advice to change the class of work that a man had been doing to some other, in his opinion, more healthy class, and so on.

441. And as all the specialist medical books on this subject indicate that a great number of the signs and symptoms of plumbism are also shown by people suffering from oral sepsis, such as pyorrhœa and bad condition of the mouth, your doctor would doubtless work closely in co-operation with the dental clinic?—If a dental clinic existed, he would, I think, work very closely in conjunction with it. He would be very useful in sending men to the dentist when they particularly needed attention.

442. You consider there is ample work for at least one doctor on the plant, and you hope to obtain the full co-operation of all employees, as well as a recommendation from this Commission in this regard?—Yes. I particularly hope to get such a recommendation.

443. I presume you would hope for the complete co-operation of all employees in the development of all reasonable precautions in regard to other matters than plumbism?—Yes.

444. That would mean the tightening up of discipline in a number of directions?—It would be necessary to tighten up discipline in many directions if we had to compel men to observe rules and precautions which they of themselves should voluntarily agree to do.

445. The best discipline is that which is supported by the sound judgment of the majority of the employees?—That is probable.

446. You have given your views as to what steps should be made compulsory. Have you anything more to say in that regard?—Experience has shown us, on the works particularly, that it is very difficult to get men to take even the most ordinary precautions to safeguard their health. They do not seem to realise that the health hazard is as grave as it may be, and even when men are warned against doing certain things we find them doing them. Such rules and regulations as are essential to safeguard the health of the employee on the works should have the power of law. That is to say, just as the employer is compelled to observe a certain procedure, so the employee should be compelled to observe rules and regulations that are for the protection of his own health.

447. The advice of the works doctor would also extend to employees in regard to such details of their home life as the matter of diet?—I think so, particularly as most of the authorities are very insistent that proper feeding acts towards lessening the susceptibility of any man to contract plumbism.

448. At Broken Hill under the Act now in force breaches of regulations such as dry boring are offences against the law?—Yes; and any operative who breaks the regulations in this respect is taken to a Court of Summary Jurisdiction and fined for breach of the rules.

449. And in other factories disobedience of factory rules entails dismissal?—From the literature I have read I gather that that is the case. It seems to me that the present law in South Australia operates very one-sidedly. It lays certain penalties and liabilities on the employer, whereas it does not in any way compel the employee to observe any rules that may be made to safeguard his own health. On that point I would like to repeat that if rules and regulations are devised or

instituted as a recommendation of the Commission they should have the force of law. If this is not done the law will operate one-sidedly, and act, I think, very unfairly on the employer, and the employer cannot be held wholly responsible for any industrial disease that may be contracted by the operative.

450. Cannot you hope that, by further intensive efforts in the direction of putting all the facts before your employees in detail, with reasons why certain precautions are to be enforced, you would get great support from a large number of the men, which would make compulsion under the law very much easier?—The great majority of our men now would see the thing in a reasonable light, and assist as far as practicable towards the observance of rules that would safeguard their own health. Unfortunately, in any organisation a certain section do not look on matters in that light, and it is to control that section only that I think compulsory observance is necessary.

451. That is to say, you fully realise that any law is applicable with the agreement of a majority?—Yes.

452. With regard to the Workmen's Compensation Acts, would you like to put in details as an exhibit?—Yes. I hand in a sheet containing tabulated extracts, and setting out the scale of payment instituted under the Workmen's Compensation Act, 1911, and the subsequent amendments, under the headings of "Permanent and Total Incapacity" "and "Death and Weekly Rate through Total Incapacity." I put that in for easy reference by the Commission. [*Vide* Exhibits.]

The witness withdrew.

GEORGE DEY, industrial hygiene officer, Balmoral Road, Port Pirie, was sworn and examined:

453. *By the Chairman*—What position do you hold?—I am industrial hygiene officer for the Broken Hill Associated Smelters.

454. How long have you held that position?—I was appointed originally in April, 1923.

455. Prior to that did you hold any similar positions?—No.

456. Were you connected with the smelting works in any other capacity prior to your appointmennt as hygiene officer?—Yes. I joined the smelters in January, 1907, and for a year at that time I was laboring about the works in various departments for the purpose of getting experience. Then I was appointed a shift boss in the Carmichael Bradford process plant. That plant has gone out of existence for some years. Subsequently for three years I was shift metallurgist. Then there was a break of two and a half years during the war. After that I was assistant superintendent in the refinery for six months, and for five years I was in charge of experimental work, being two years ago appointed to the position of industrial hygiene officer.

457. *By Mr. Gepp*—You were a member of the A.I.F.?—Yes.

458. When did you enlist?—In April, 1915.

459. What unit were you in?—I left Australia as a company commander of the 27th Battalion on May 31st, 1915.

460. You were severely wounded?—Yes; at Pozieres.

461. Have you quite recovered?—As far as possible.

462. You are in generally good health and fit to do your work?—I was never better.

463. What experience had you in mining and metallurgy prior to coming to Port Pirie?—I was for six months in the Kaitangata Coal Mine in New Zealand. Prior to working in the field I attended the Otago University School of Mines, and obtained an associateship in mining and metallurgy.

464. After your coal-mining experience in New Zealand, where did you go?—To the Bonanza Gold Mine at McRae's Flat, in the Dominion. After that I was with a civil engineer in Dunedin, and subsequently was for six months in an engineering shop there. Next I went to Broken Hill, and worked 12 months underground and 12 months on surface work in the milling operation. After that I came to Port Pirie in January, 1907.

465. Except for your period at the front, you have been at Port Pirie since then?—Except when the works were shut down owing to a strike in 1909, and I worked as technical man with a prospecting syndicate in New Zealand for a few months.

466. You have held your appointment as industrial hygiene officer since April, 1923?—Yes.

467. What are the general instructions of the management in regard to your duties?—The control of those matters which are related to the improvement of the working conditions throughout the plant from the point of view of the health of the employees generally, and to ensure that the various appliances which may be installed from time to time to meet these requirements are availed of to the fullest degree, also to have control of the change house. I supervise the watering down of all areas about the works and any sanitary measures. I examine the working places from the health standpoint, and undertake any compilation of the history of employees from the industrial point of view. I supervise safety appliances throughout the works, and improve them if possible. The first-aid room and its attendants come under my supervision, also the reporting of accidents to which they attend. In addition I control the fire-fighting department and appliances. That is necessary, because it is so closely associated with the watering down of the roads, which is done from the fire service main. A big part of my efforts consists in trying to assist the men I see not taking precautions, and to explain to them the dangers which they run through negligence, ignorance, or carelessness. In such cases I speak to the men and draw the attention of the foreman or superintendent to any practices that may be dangerous.

468. Are you aware of the serious increase in the number of reported lead poisoning cases during the last two or three years?—Yes.

469. Have you from your study of the subject been able to arrive at any definite reason for this increase?—I have not.

470. Are the conditions in the plant now better or worse than they were in 1921?—They are very much better.

471. Amongst sections of the workers, has the incidence of lead poisoning, accordng to the reported cases, been particularly heavy?—Yes; we notice that foreign labor generally shows a very much heavier incidence of reported cases of plumbism than ordinary British labor. The Maltese are the worst on figures of all the foreigners.

472. Your figures would be the same as have been put in by Mr. Somerset?—Yes.

473. Generally speaking, are those men of long or short service?—Generally of short service.

474. Would you say that foreigners appear to be more susceptible to lead than British-born workers?—Our records are the only guide as to that, and when our records show such a high percentage of foreigners becoming affected, I should say yes.

475. Would you say that, in your opinion, they are not as well able to look after their health under Australian conditions as the average Australian?—The doctors' reports indicate that the incidence of plumbism is apparently heavier among foreigners than among British-born workers, and by comparison one would be inclined to think so.

476. Might this indicate that a change of environment and of food and climate has an effect?—I could not say as to that. The fact stands out on the figures that they are more susceptible.

477. I understand that you are a member of the local municipal council?—Yes.

478. Do you know anything of the conditions under which many of the foreigners are living?—I have no personal knowledge of their conditions, but I have a recollection of the housing conditions of foreigners being mentioned from time to time by certain councillors with regard to their conforming to the Health Act in the matter of crowding and that sort of thing.

479. Why is it that so many foreigners are now employed by the company?—British labor is not always available in the quantity required, and at times there is seasonal variation in the work of the State which takes men away. When foreigners are there we employ them in that case.

480. Has the company ever taken any step to encourage the influx of foreigners to Port Pirie?—No.

481. Does the company exercise any preference in favor of British-born labor?—Yes.

482. Will you describe the procedure in that connection?—At the gate when the timekeepers are calling for labor British labor is called before foreign labor. If there are British available at the gate their names are called and exhausted before foreigners are put on.

483. You have stated that the conditions in the plant are now better than they were in 1921. I presume you can support that statement with details from your own knowledge?—Yes.

484. For the information of the Commission, you might indicate improvements made in as full detail as you can?—Taking the plant in metallurgical sequence and following the ore through the plant, in the first place more watering down services are available when any ore is handled from our stacks, and at the ore unloading belt at the Dwight & Lloyd plant, where most of the ore which we treat is unloaded, a watering down service has been installed, so that the man unloading the ore may water down any ore that is dry. On the A machine of the Dwight & Lloyd plant the uptake shafts which carry the fumes away as the palettes discharge have been improved, and are now very much more effective than previously. A screw conveyor to deliver the pre-roast from the A machine on to the tray conveyor has been installed and found effective. This is being extended to all machines. The water sprays on the tray conveyor have been improved to keep down the dust. Water sprays have been installed in the vacuum chambers so that the chamber material may be removed in moist condition, thus eliminating the dust which previously attended this operation. Water seals have been fitted to the cyclone hoppers, so that the cyclone dust is now removed in the form of sludge instead of fine dust as was the case before. On the B machines of the Dwight & Lloyd plant hoods have been placed over the discharge shoots, so that dust due to the tipping of the palette is now drawn back on to the surface of the charge instead of being allowed to blow about as previously. In general a more extensive watering down service has been installed, and closer attention paid to this phase all round.

485. What has been done at the Huntington-Heberlein plant?—The flues of the plant were rebuilt some time ago with much more satisfactory results.

486. Has anything been done in the feed bins of the Huntington-Heberlein, which has helped the position, since 1921?—Sprays have been installed over the feed bin to keep down the dust there.

487. You come from there to the blast furnaces?—The biggest improvement in the blast furnace department is the elimination of the old slag pot method of removing slag in the molten state, and the substitution of the granulating process, which not only reduces the number of men exposed to any risk of leading, but makes it a much cleaner, better, and safer process.

The witness withdrew.

JOHN MALYCHA, enginedriver, 8, Frederick Road, Ellendale, was sworn and examined:

488. *By Mr. Robinette*—What is your occupation?—I am an enginedriver.

489. How long have you been employed at the smelters?—Twenty-three years.

490. Have you been in one department all the time?—Yes, with the exception of about 18 months, when I worked on the steam crane on the wharf.

491. Practically all the time you have been employed on the slag boilers and engines?—Yes.

492. You have been absent from work because of lead poisoning?—Yes.

493. For what periods?—I was absent nearly four weeks in July, 1919. I was also away a few days in 1923 with lead poisoning. I had another bad attack last November, although I continued working. Then I was absent four weeks in January, and am away from work now, having been off since Easter Sunday.

494. Do you consider that the dust is worse now than it was prior to the shut-down?—Yes, absolutely.

495. Can you tell the Commission what causes you to form that opinion?—The dust I speak of comes from a point near the engine-house. The most dust I receive comes from the Skinner and Barrier roasting furnaces.

496. Can you see the dust?—Yes. I have seen it flying around inside the engine-room pretty nearly every day, more or less.

497. You clean the engine every day?—Yes, and I notice that two or three hours after I have cleaned the engine the dust collects on it again. I notice it mostly flying around where the sun is shining. You can see the shining specks in the sun. Without the sun I cannot see it in the atmosphere, although I can see where it is settling down. All the time I feel grit in my mouth, which causes me to spit repeatedly.

498. Did you notice whether the dust settled anywhere else?—It settles on the coal heap. Coal was brought to the stoke-hole near the engine-house, and in a day or two it was covered with dust. I have also noticed the dust settle on my clothes. The fumes were very bad last Good Friday. They were so bad that all the afternoon I could not see my signalman.

499. You get the dust from the bottom and top floors?—Yes, and also from the Dwight & Lloyd at times.

500. When the wind is from the west you get the dust and fumes from the heap sintering?—Yes.

501. You are practically working in fumes no matter which way the wind blows?—Practically. Of course, if there is no wind the fumes go straight up.

502. *By Mr. Gepp*—You have worked on the smelters for 23 years?—Yes.

503. Practically all the time on the slag boilers and engines, except for 18 months on the wharf?—Yes.

504. Prior to July, 1919, did you suffer from any industrial sickness?—Yes, but I do not remember the occasions now.

505. Would it be back in 1910 or some date of that sort?—I think it was in 1918. Dr. Dawson attended me and ordered me to go away for a month. I do not remember how long I was away from work.

506. Was your illness then certified as lead poisoning?—Yes.

507. How old are you?—I shall be 50 next month.

508. So that you were about 27 years of age when you came to Pirie?—Yes.

509. You say that in your opinion the dust is worse now than it was prior to the shut-down?—Yes. I have never experienced anything like it before.

510. Do you mean that in relation to all the works or to your particular job?—I cannot speak of other parts very much. Where I am working, however, the dust is much worse.

511. Your occupation is near the boilermakers' shop?—Yes. There is a boiler and engine-room there.

512. *By Mr. Pearson*—You said you consider the dust comes from the Skinner and the Barrier roaster furnaces. Do you mean from the whole of the operations in connection with those furnaces?—It comes from the building that houses those two furnaces.

513. You were driving that hoist before that building was built?—Yes; when the old Hegeler roasters were up.

514. You consider the conditions are worse now than under the old arrangements?—Yes.

515. *By the Chairman*—Since and including 1919 you have received four certificates for lead poisoning—four weeks in July, 1919, half a week some time in 1923, four weeks in January, 1925, and since Easter Sunday?—Yes.

516. Were the attacks similar in each instance?—Yes.

517. What has been the chief trouble?—A pain in the upper abdomen. Afterwards I get pains in my side and back, especially at night time when I am in bed.

518. Have you had any trouble with your teeth during that period?—I did in 1917. The doctor ordered me to have them drawn. I had them drawn then.

519. Do you wear a plate now?—Yes.

The witness withdrew.

GEORGE DEY, industrial hygiene officer, Broken Hill Associated Smelters, Port Pirie, recalled and further examined:

520. *By Mr. Gepp*—You were dealing with the improvements within your knowledge on the blast furnace plant, and had covered the elimination of slag pots and the substitution of the slag granulating process, and also, I think, the improved hoods and curtains?—I have not dealt with the last named. Within the last two years all the old hoods have been taken from over the slag pots, and a much better type has been erected to more efficiently draw off the fumes that rise as the slag runs from the furnace, and as a further protection curtains of iron plate have been hung round the bottom of the hoods to cover the space between the bottom of the hood and the top of the slag pot. These have made the hood much more effective, so that the amount of fume that escapes when the slag is running is negligible.

521. What improvements are there on the top floor?—On the top floor the water service on the top of the bins has been improved by installing a new hydraulic water service. The ordinary town pressure is not always sufficient to carry water to the tops of the bins in sufficient quantity to spray the material up there, so a high pressure service has been laid on, and that is always sufficient. The control of the sprays on the top of the bins rests with the man operating the bin below, so that he knows when to turn on the water and how much to turn on. He is the man most affected by dry material, therefore he has the remedy in his own hands. One of the biggest improvements there is the utilisation of British coke. Owing to the nature of this coke it conduces to better furnace conditions, so that the furnaces run more regularly, and do not give the metallurgical troubles that we used to get from the coke we previously used. That means less attention necessary to the furnace, and less smoke and everything. That is a big improvement. Many additional taps have been put in, and the watering down of the floor itself is more regularly done now than it was before.

522. Have you anything to say regarding the refinery?—In the refinery the uptakes from the retort furnaces have been improved. New pipes have been put in, giving each hood an individual pipe to draw away the fumes instead of two hoods running into one pipe. Previously one pipe served two retorts. The shape of the hoods has been improved. In addition, small pipes have been placed over the vent hole of each condenser to carry off the fumes which issue from this hole. An improved hood has been made for the cupel furnaces to draw off the fumes generated during cupellation. At the antimony slag tip a good water service has been installed to water down the slag before it is shovelled away. The method of transferring the refined lead from the refinery into the market lead kettles has been greatly improved. Previously the refined lead ran from the refinery furnace through an open chute, fell into the market kettle, and produced a considerable quantity of dross during the process. This dross had to be skimmed off and handled back to the blast furnaces. Now the refined lead is run into the market kettles through a closed pipe, delivering right to the bottom of the kettle. This prevents oxidation, and so reduces the quantity of dross formed. Previously up to three or four pots of dross were produced from each charge. Now only a few bars of dross are produced per charge, and this dross is of a much better nature to handle. In the litharge mill the exhaust fan has been speeded up, so that the dust caused through the packing of the litharge is drawn away. Special precautions are taken there besides this with regard to bathing and general hygienic measures. A hood is placed over the ore crusher bin so that the ore being handled into the bin is put there under suction, and any dust produced in tipping the ore into the bin is drawn away. This has effected a great improvement. Previously dust used to rise, and the men used to inhale it, but now it is practically eliminated.

523. There must be a number of general points about the job where improvements have been made?—One big improvement is the watering down of the works area, and a regular watering down of all working floors. This is very much more systematically and thoroughly carried out than it used to be. Hydrants from the fire service have been installed all over the works area where the bulk of the men work, so that there is practically no part of the plant that is not commanded by a fire hydrant for watering down purposes. That is done on an organised system, so that different officers of the company are responsible for their own areas. That has been put down on a plan. The change house has been installed for about two years, and additional crib houses with wash-basins, &c., have been put in where necessary, and some of the older crib houses have been improved. In order that the men's cribs might be more palatable during hot weather, cool cupboards have been provided in most of the crib houses. In addition there has been a constant watch over operations, and a number of things difficult to specify have been done. All these things are receiving attention, and anything we can do is being done.

524. If a shift worker is feeling a bit off color, but not ill enough to stop away from work, do you make any arrangements to give him a change from shift work?—Ever since I have been on the works it has been the custom to transfer any man to day work or on to another part of the works on shift work if he desires for any reason, such as that the job does not suit him.

525. Are any further improvements being made at present?—One big improvement nearing completion is the new bullion handling scheme. This will effect a very big improvement from a health standpoint. With the present method of running lead from the furnaces into small moulds it is very difficult to devise any scheme whereby the fumes may be drawn away; that is to say, any ventilation scheme depends for its success on being able to catch dust or fumes at the point of origin. To catch them from the lead furnaces under present conditions at the point of origin would be a very difficult matter, but when the new scheme comes in with large pots there will not be so many men around the furnace, and it will be possible to take care of fumes. They will be more like slag pots, and it will be possible to put a hood over the top. That will greatly improve the conditions. Moreover, it will reduce the number of men who will be exposed to any danger of plumbism. In that connection there will be drossing furnaces as a part of the scheme, which will mean that that work will be done near the blast furnaces instead of in the refinery, with probably less handling of the bullion by the men and under perhaps better conditions. Another improvement being carried out is to the bag houses. When this is completed not only will the gas be blown into the bag houses, but the filtered gases will be boosted up the stack by a fan and delivered right away from the works.

526. These improvements are being done on day shift now?—Yes.

527. And that is the reason why the big stack is showing smoke at present?—Yes. Until this scheme is completed the bag house at present has not the full capacity to deal with all the furnace gases.

528. When all these are completed, will all the furnace gases be filtered?—Yes.

529. What happens to the fume when it gets into the bags?—It falls from the top of the bag into a hopper underneath each line of bags, there being one hopper for every two or three lines. From there it is carried to the outside of the bag house by means of an archimedean screw into hand barrows. These barrows are then wheeled into a burning chamber, where the fume is ignited. Once ignited, it burns

to a clinker. It is then taken in the same barrow, after being thoroughly wetted, and sintered in the Huntington-Heberlein pots.

530. There have been for some years mechanical shakers at the bag house?—Yes.

531. But the present alterations are connected with an improved design invented at the works. Is that so?—Yes. The old type were not quite satisfactory, and required considerable maintenance.

532. Of what material are those bags?—Flannel.

533. So that you consider the alterations now in progress at the bag house will effect considerable amelioration of any conditions that may have been previously occurring?—Yes, very great.

534. In regard to the main bag house at the blast furnaces, am I correct in assuming that when the improvements are made, the whole of the gases, after being filtered, will be delivered from the top of the big stack?—Yes, at a height of 212ft. The A Dwight & Lloyd bag house is at present under construction.

535. Will the design of this bag house be on the improved principle which you have been describing?—Yes.

536. And this programme will proceed until the gases from both the Dwight & Lloyd plant will be treated?—Yes.

537. Is there any other point in relation to the Dwight and Lloyd machine that you wish to mention?—A slow conveyor to deliver material from the A section of the Dwght & Lloyd machine has been tried and very effective. This type of conveyor is being installed on all A section machines.

538. With regard to additional improvements at present under consideration or contemplated, Mr. Somerset has dealt in fairly full detail with some of the items, such as the cooling of the Huntington-Heberlein pots, the alterations in the refinery, addition to the change house arrangement and improvements therein, and some other points. Seeing that it is in your department, you might deal in somewhat more detail with the change house arrangement?—When the original change house was built it was erected in such a way that it would be very easy to extend it on either side, and as the demand for the change house grows the company will extend it as required. Any improvements that we can make with regard to the lay out of it will be incorporated. It is the intention of the company to make the change house as up to date as possible.

539. I have heard comments, quite unofficially, that the change house is draughty. Does that mean that it feels cold to the men? Do you think any improvement could be made by providing a certain amount of heating?—That might possibly help.

540. Is it on the cold side in winter?—The temperature would depend on the temperature outside. There is no heating apparatus there.

541. Supposing the men were coming off at 12 midnight, it might feel chilly to them on a cold, frosty night?—Yes; but I should think that if the men were coming off work in a hot state, even for a few minutes cold to be endured before getting under a hot shower would be preferable to sitting in one of the buses and going home in their working clothes.

542. As officer of this department, any representations to you would be most sympathetically considered, I presume, in connection with the warming of a portion or all of the change house if desired?—Certainly.

543. Is there any other point you wish to make in regard to the change house?—We are making improvements in the size of the lockers. They were originally too small, and representations were made to the company on the matter. A number of lockers of large size are on order, and we are converting the smaller ones to the larger size.

544. There is a man in charge of this change house every shift?—Yes.

545. So that there is a complete safeguard against theft?—So far as the man is capable of protecting the men's property, but thefts are reported to me from time to time.

546. A man could not use a hammer and chisel, for example, on a padlock?—No.

547. Have you any preference for the locker compared with the overhead system of storing shift clothes, such as they have at South Broken Hill?—I prefer the locker, because once clothes are locked up, and they can be hung up when we get the larger lockers, or put away, it is much better than having them hanging on a rack up on top.

548. Does the drying system for the men's clothes work satisfactorily?—Yes.

549. It is availed of?—To a limited extent.

550. Have you arrangements for men doing their own laundry work if they so desire?—Yes; there are wash troughs alongside the change house and a very good supply of hot water.

551. I mentioned some of the points given by Mr. Somerset in his evidence in chief. Are there any other points regarding additional improvements, considered or contemplated, on which you wish to give evidence?—The matter of removing the feed bins from the top floor of the smelter furnaces, and the doing of that work on the ground away from the furnaces, has been mentioned, and, I believe, is under consideration. The matter of suction fans to draw off fumes is also receiving attention.

552. In particular places, or all round the job?—In the refinery it is now under consideration, and the work is on the way for the cupel yard. I am considering the matter of suction in other parts of the works to deal with certain dust and fumes.

553. Have you a plan of the works for the information of the Commission?—Yes, although it is not quite up to date. The information on it will be incorporated in one which, I understand, is being prepared (*vide* Exhibit 4).

554. Will you describe the plan?—It is a plan of the works area, and the different colors specify the areas over which different superintendents are responsible for watering. Copies of that plan, or parts of it, have been placed in the hands of the superintendents concerned, and they are responsible for the watering down of the area specified in their particular plan. The plan also marks the sites of the change house, crib houses, and drinking fountains around the works. A list on the left hand side sets out the number of drinking fountains, change houses, and crib houses on the works.

555. The company has spent a considerable amount of money in the last year or so in connection with the watering down of the whole plant. Is any work going on now in the direction of extending watering down?—That work has been proceeding constantly since I have been connected with my present position. It is still going on, and the area to be watered down is being very greatly extended.

556. There is still a considerable amount of money being spent in that direction?—Yes.

557. And more is to be spent?—Yes. I recently issued one order for 1,500ft. of piping for the railway yard, and another order covering quite as much material for what we call the salvage dump, where the old building material is taken when not required.

558. What particular work is done in the railway yard?—All ore from Broken Hill is delivered to our railway yard, and in order more thoroughly to moisten any dry material there it will be necessary to have a fresh water service commanding every siding.

559. You will continue this programme until every part of the works you consider necessary is covered?—Yes. The work has been going on constantly. There is difficulty in carrying it out, however, as we are short of tradesmen. To keep all the improvements going means that some of them must be spread over a considerable period.

560. Are you aware of the important bearing that personal cleanliness has upon the prevention of plumbism?—Yes.

561. Do you feel satisfied that the men are co-operating as fully as is desirable in this important particular?—No. I think there is room for considerable improvement in that regard.

562. What is being done to provide facilities for cleanliness?—In the first place there is the change-house and the crib-rooms containing hand and face washing facilities. They enable the men to leave the works clean, and to leave their working clothes behind them. It also enables them, before they have meals, to wash their faces and hands.

563. Do you find it is a matter of slow growth to convey by education the necessity for care in those directions?—It seems difficult to make the men realise that care is necessary.

564. It is really part of your work to keep pegging away at this particular thing in order to get co-operation in this regard?—Yes. Every day I am at that work. I speak to different men, and point out mistakes they are making in this respect. I bring such lapses under the notice of the superintendent and foremen.

565. Have you a plan which shows the lay-out of the crib-houses, change-houses, and so on?—The plan I tendered shows the watering down process. It also shows the location of the crib-rooms, change-houses, and drinking fountains.

566. Can you give us any statistics in regard to the change-house and the number of men using it?—For this year the average number of men using the change-house in 24 hours is 281. Of that number an average of 210 bathe. That means on an average 61 men used the change-house merely to change their clothes or to wash their faces and hands.

567. *By Mr. Robinette*—Does that mean that an average of 271 men change their clothes in the change-house?—It may not mean that, because the figures include what we call casuals. The change-house attendant at each shift picks out the number of men who use the change-house on each shift. He divides this number into two classes, namely, the number of men who come off in the shift and casuals who drift in during the day for a bath. The casuals may not use the change-house as a change-house but as a bathing-house.

568. There are not 271 lockers, are there?—Yes. There are more than 300 lockers.

569. *By Mr. Gepp* (to the Chairman): When we were making inquiries the other day we found that the lockers used were about 20 short of the available lockers. The attendant told us that he was never sure of the exact number used, because a few of the men were always going away and leaving their things in the lockers for him to watch for a couple of weeks. He said definitely that about 20 were spare lockers available to any man who wanted them. (To witness): There are 320 lockers in the change-house?—Yes.

571. Your figures are averaged?—Yes. The maximum number of men using the change house in any single day was 329, including men who came off shift, and those who came from their homes to have a bath and went back home again.

572. In your figures you do not include men who went to the works and did their laundry work?—No. I have not taken the number of those men.

573. What is the maximum number who bathed in one day? 265.

574. What is the minimum number who bathed in one day?—153.

575. In regard to the education of all concerned in respect to the necessity for personal hygiene, have any instructions been issued, either in writing or through the various devices, to indicate to the men the necessity for taking precautions?—Yes. Instructions have been issued in four languages. They were handed to the Commission by Mr. Somerset.

576. Are verbal instructions given regularly by departmental officers and yourself when the men are observed to be taking unnecessary risks?—Yes.

577. Do you make regular tours of the works?—Yes. I am around every day.

578. On those tours do you watch for carelessness or ignorance on the part of the men in a health direction?—All the time.

579. What action do you take when instructions are disobeyed?—I speak to the man straight away, and then go to his boss and tell him. If I found the boss first by the time I got him on the scene the conditions may have changed, that is to say, the man may be somewhere else, and not doing what he was when I noticed him. Therefore I speak to the man to be sure of it. If necessary, I also speak to the superintendent.

580. Have you any idea of the sickness generally amongst the employees, apart from plumbism?—I have the figures from our sickness and accident fund, which I will hand in.

581. What is the average time lost per annum?—The average period of absence per member per annum in the last two years, apart from plumbism, was 7½ days.

582. Do you consider that unduly heavy?—No. It is lower than the average for Australia. It is below the figures of the Royal Commission on National Insurance.

583. Have you any details as to the types of illness that predominate among the men at the works?—My table sets out the main ones.

584. What are the main types?—Bronchitis, gastritis, rheumatism, and tonsilitis are responsible for a large number of the cases.

585. In your reading on plumbism have you come across any mention of the effects of over-indulgence in alcohol?—Yes. All the literature I have read condemns the use of alcohol as being very injurious in the case of plumbism, and as a predisposing factor to plumbism in lead work.

586. When you say "use," do you mean "abuse?"—Yes.

587. Do you think alcohol, which may be defined as the abuse of alcohol, is influencing the position at Port Pirie?—I cannot say for certain, but I think probably it is in some cases.

588. Would you say the employees at the smelters are not sufficiently aware of the dangers of drink in connection with themselves?—I feel sure some of them are not.

589. Do you know the holiday camp at Weeroona?—Yes.

590. When was it established, and by whom?—It was established in 1918 by the company.

591. What was the object of establishing it?—The idea was that not only would it enable an employee to have a holiday, but it would enable him to take his wife and family with him.

592. Would that in any way reduce the cost of the holiday to the man and his wife and family?—Yes. The company transport an employee, his wife, and his family to Weeroona free of charge, and accommodate them there at a very low cost. I have the figures. The company arranges for employees and their wives and children to go there at 25s. a week for a man or a woman or a child over 11 years of age, and 12s. 6d. a week for children between three and 11 years old. Children under three are kept free. That means that, with no expense in transportation, and such a scale for young children, a man could take a holiday there at very low cost—lower than he could in practically any other way. By making this arrangement the company felt that, since it was necessary that both the man and his wife should have a holiday, it would be taking proper care of the man by also taking care of his wife and family.

593. The facilities for transporting both ways were and are reasonably ample for such a scheme?—I think so. As many boats are are necessary to carry the people across are provided.

594. Has any use been made of Weeroona as a convalescent camp for reported lead poisoning cases?—Yes. Last year 12 cases went there.

595. Is it optional for them to go?—Yes.

596. What cost is laid upon a man who goes there in those circumstances?—None at all. The company pays his expenses.

597. Has that been a benefit in cases within your knowledge?—I do not know much about that phase, but I should say it would be a benefit.

598. Is there anything in the way of holidays provided among the conditions of employment at the smelters?—Yes. The company has arranged a scale of holidays for employees. I have the scale here. Briefly, it is divided into two scales, one for six days a week men, the other for those who work seven days

a week. The six-day men get 12 holidays per annum on full pay, provided they do not miss more than 12 days without a certificate for sickness.

599. And without leave from their foremen?—Leave from their foremen is counted as ordinary absence. Absence without leave is penalised by being counted more.

600. *By Mr. Pearson*—Do I understand that that cuts out the 12 days that they are entitled to under the scale?—No.

601. *By Mr. Gepp*—A man who lost 13 days under this regulation would not have his whole holiday cancelled?—No. He would lose one day. He can lose 12 days without interfering with his holiday. If he loses one day above that 12 days it is a day that he misses from the holiday.

602. Then a man who is working as a shift worker seven days a week gets his full 14 days?—Yes.

603. For that he has to be employed 12 months?—Yes.

604. And if a man is employed six months he gets half his holidays?—Yes.

605. Do you wish to put in this table?—Yes. [Table put in and marked Exhibit 5.]

606. I presume that in those circumstances most of the employees get their full holidays?—A very large number of them get a full holiday. Most of them get some holiday out of it. When holidays become due the names of men entitled to them are put on a list. The number of days due to them is put alongside their names.

607. When was this scheme put into operation?—Covering the 12 months ended September 3rd, 1919.

608. What was the object of the scheme?—The company recognises the necessity of a man having a holiday once a year, and it recognises that if a man could have his holiday on full pay he would be more ready to take that holiday than if no pay were attached to it. If he were getting his holiday on full pay there would be less financial worry, and in every way it would be an inducement to a man to keep more regular time and so benefit the man in that way.

609. If a man on the works is overtaken by accident or sudden illness are there any facilities for dealing with him?—Yes. We have a first-aid room and a qualified attendant on every shift.

610. Do you make a study of the literature on plumbism?—Yes. I am always reading something about it.

611. Have you come across any mention of the need for medical examinations of employees engaged in this industry?—Yes. All the works I have read on the subject stress that.

612. What is the trend of the best opinion on this subject?—That before a man is engaged in any lead industry he should have a preliminary examination.

613. Is any other examination recommended?—Yes, periodical examinations.

614. What authorities can you mention as supporting these views?—Legge and Goadby and English regulations on the subject.

615. What is the title of Legge and Goadby's book?—"Lead Poisoning and Lead Absorption."

616. Who are Drs. Legge and Goadby?—They are two very eminent authorities. Dr. Legge is a medical inspector of factories in England and lecturer on factory hygiene at the University of Manchester. Dr. Goadby is pathologist and lecturer on bacteriology at the National Dental Hospital, England; also surgeon to certain smelting works and white lead factories in East London.

617. Are the English regulations mentioned by you issued by the Home Office of the British Government?—Yes.

618. Legge and Goadby's book is taken as the standard work in the English language on the subject, is it not?—I believe so.

619. What do you know of regulations covering the white lead industry, either from your reading or personal observation?—Special precautions are taken in the way of examination of the employees. Frequent inspections have almost eliminated plumbism from the white lead industry. Previous to those regulations being enforced this industry suffered very badly.

620. Are the employees examined regularly?—The men are examined weekly.

621. The result of these regulations and examinations is that the position has been so improved as almost to reach elimination?—Yes.

622. Is there a litharge mill at the smelters?—Yes.

623. Is the work in that mill regarded as hazardous?—Yes.

624. Have there been any cases of reported plumbism from there?—When the mill first started there were cases, but the industry was new in Port Pirie, and since proper precautions have been put in force the trouble has been practically eliminated.

625. What do the precautions consist of that have eliminated the trouble in the litharge mill?—In the first place there is an exhaust fan attached to the crushing mill, which is enclosed, and the fan creates a minus pressure in this enclosure, so that the dust does not escape out of the enclosure. That dust is carried into a cyclone collector. Smoking is prohibited in the building. Then there is a change-house next to the building where the men bathe as soon as they have finished their work. Overalls are provided, also caps, gloves, and respirators. The men are given a certain amount of work to do, and after they have finished that work they are free to go, so that they have every inducement to shorten their time in the litharge mill.

626. These precautions, of course, are very strict and very considerable on account of the particular nature of the employment in that place?—Yes, and they have proved quite effective.

627. Do you have any difficulty in securing men to go into the litharge mill?—No; there is no trouble there. The men get a higher rate of pay, and their being able to go home after finishing the particular quantity of work allotted is an inducement. In any case the work is intermittent and the tonnage is not great during the year.

628. As the officer particularly responsible for hygiene at the smelters can you make any specific suggestions in regard to the alleviation or elimination of lead poisoning?—Yes. I believe a starting point is medical examination of new employees, and the provision of a medical department as a permanent part of our organisation.

629. What would this do?—It would enable effective preventive work to be done. It is recognised by authorities such as Legge and Goadby, and others, that some people are likely to be predisposed to plumbism, and if they were advised that the industry was not safe for them, it would be better for them and for the industry generally.

630. As to working conditions?—That is a matter of constant study. There is always some point cropping up, and medical and technical men could work together and do a lot of good in prevention, supervision, and education of all concerned. A warning given by a medical man would carry more weight than one coming from a layman. It is essential that employees should take greater care of themselves. They could be given encouragement to do so, and any rules for the preservation of health must be loyally observed. They should be made enforceable.

631. You mean, I presume, that the company and the men working together in a sort of helpful co-operation could bring about a much better condition by the education of all concerned?—Yes, and by adhering to regulations which exist in Great Britain and elsewhere. Certain parts of those regulations are enforceable, not only against the employer, but against the employee.

The witness withdrew.

The Commission adjourned.

[At Congregational Hall, Port Pirie.]
Friday, May 1st, 1925, at 10.30 a.m.
Present—
Dr. K. R. Moore (Chairman).
Mr. H. W. Gepp.
Mr. J. L. Pearson.
Mr. W. Robinette.

GEORGE DEY, industrial hygiene officer, Broken Hill Associated Smelters, Port Pirie, was recalled and further examined:

Mr. Robinette (to the Chairman): I draw attention to question 629 of yesterday's official transcript of the evidence. The witness, Mr. Dey, used the term "weeded out" in relation to people predisposed to plumbism where the words "advised that the industry was not safe for them" now appear. The latter phrase was substituted upon my calling attention to the words "weeded out."

632. *By Mr. Gepp* (to witness): You have heard what has just been said, and if you desire to make any explanation in regard to the matter the Commission will be pleased to hear you?—The explanation which appears in the evidence would certainly have been added to my original remarks, whether Mr. Robinette had called attention to the phrase "weeded out" or not.

632A. When you used the term "weeded out," did that mean that men not physically fit should not be permitted to be employed in the industry?—Yes. The idea in my mind was this. If, on a man applying for work in the industry a medical examination revealed that he was likely to be susceptible to lead poisoning, then in his own interests and the interests of every one it would be better that he did not enter the industry.

633. You did not desire to cast any slur, direct or indirect, on anybody connected with the industry?—That is beyond my power altogether. It will be realised that my evidence was dealing with preliminary application. Therefore, it must apply to people not already in the industry.

634. *By Mr. Robinette*—You were not dealing with applications, but with men who had been employed a month?—No; I was dealing with applicants only.

635. You know that the chief objection in the medical examination dispute was that the men employed in the works contended that, if the principle of medical examination by the company's doctor were instituted, men found to be suffering from lead poisoning would be weeded out?—I know that that was their objection, but whether it was right or wrong is another matter.

636. *By Mr. Gepp*—Are you a member of any institute of mining and metallurgy or any institute of a technical character?—I am a member of the Australasian Institute of Mining and Metallurgy.

637. Which indicates that your past experience was as previously given in Mr. Somerset's evidence?—I presume so.

638. Have you any figures in regard to expenditure in relation to work, directly or indirectly, associated with the question of improvement of health conditions?—Yes.

639. Will you give us those in order?—Yes. In the first place there is the supply of magnesium sulphate effervescence to keep the men's bowels open.

640. What is the prescription?—It is as follows:—Magnesium sulphate (dried at 54.4 degrees C.), 77 parts; sodi bi-carbonate (powder), 72 parts; tartaric acid (powder), 38 parts; citric acid (powder), 25 parts; refined sugar (powder), 21 parts. This is available to the men, and it was instituted on the advice of Dr. Robinson in 1923. Up to date, from June, 1923, to March, 1925, more than half a ton of this has been used by the men—1,472 lbs., at a cost of £215 17s. 6d.

641. It is made up in bulk in Adelaide?—Yes; and sent to the works.

642. Can you give us any figures in regard to Weeroona?—Yes. The company established the camp at Weeroona at a capital cost of £24,600.

No. 57.

643. How much has been spent by the company in connection with the operating of Weeroona?—£9,201.

644. So that the total cost to the company has been how much?—£33,833.

645. There have been (as described by Mr. Somerset and yourself) a number of crib houses erected during the last five years?—Yes.

646. Can you give us the capital costs and any other expenditure in connection therewith?—The cost of erecting and equipping them was £2,648.

647. What about the drinking fountains that were mentioned?—The cost of installing them was £1,376, and, including the year ended July, 1921, to this month, the cost of maintaining them has been £1,486.

648. Do you mean by maintenance the upkeep of the filters and the provision of ice?—I referred to the cleaning, repairing, and maintenance of the fountains. The figures did not include the cost of ice.

649. In regard to watering down you mentioned yesterday that very heavy capital expenditure had been incurred during the past few years in making this more efficient, and that further expenditure was continuing. Can you give the Commission any figures in regard either to the capital or operating costs in this direction?—Including the year ended July, 1921, to April, 1925, £3,042 was spent in labor.

650. That is labor only, without the cost of supplying water?—That is so.

651. And does not include any question of upkeep at the main or pumps?—The amount relates to labor only. The roads may be watered down with salt water, but the ore has to be wetted with fresh water for metallurgical reasons. Including the year ended July, 1921, to April, 1925, the cost for fresh water for that purpose was £849.

652. The fresh water is used because it would be inadvisable to use salt water on account of the metallurgical reactions?—Yes.

653. *By Mr. Robinette*—Do your figures give the total cost of water or the cost for watering down?—It is the cost of the water used for watering down only.

654. How did you arrive at the cost? Have you separate meters?—There are separate meters all over the works. An estimate has been made of the water used for this purpose. The figures are an estimate, but they have been safely estimated.

655. In the refinery where you water the dross down you have not separate meters. You cannot, therefore, tell whether the water is used for watering down or for drinking?—It is an estimate.

656. It is an estimate, not the actual cost?

657. *Mr. Gepp* (to the Chairman): The witness is on oath, and the estimates must be considered as reasonably close for the purpose for which he is giving them.

658. *By Mr. Gepp* (to witness): There have been a large number of jobs connected only with the questions of improving the health conditions and the elimination of dust and smoke. Have you any figures covering such jobs—such jobs, I mean, as are not individual picked jobs, but are numerous in character all over the works?—Yes.

659. Will you please give us some of the figures as examples?—Yes.

660. Please proceed to do so?—I would explain that some of these things were done before I was actually connected with this work, and the figures are taken from the company's records. The narrative on the job order to which the work was done is set out as on the original order. The details are as follows:—

	£	*s.*	*d.*
Cut off the bottom of the ventilating funnels so that they will be 6ft. above the floor level	5	18	1
Make repairs and adjustments to the D. & L. ventilating fan	8	4	11
Box in returns elevator, making the top sides moveable to facilitate repairs to elevator	56	5	11

	£	s.	d.
Make necessary alterations to the stack valves to prevent leakages	16	9	5
Bolt down iron plate on floor A and B sections, and repair floor	15	14	9
Shift D. & L. coppers to the shed at H.-H. plant, and make alterations to buildings	51	0	4
Fix covering over scales of D. & L. mixing plant	10	13	5
Make and instal dust collecting hoods at tip end of 4, 5, and 6B machines similer to B3	309	0	0
To carry the cost of preventing leakages of gas in A and B sections, D. & L. fans and stacks	159	0	0
Level and concrete floor around B1 and B2 fans at east side of shift bosses' office	120	0	0
Plate floor at No. 8 conveyor, D. & L.	181	0	0
Alterations to hoppers at discharge end of A machine to reduce dust	101	0	0
Alterations to hoods at discharge end of B machines to reduce dust	80	0	0
Carry cost of concreting western floor of D. & L. plant from north side A cyclones to south end of spare part house	410	0	0
Increase height of stack at discharge end of A1 15ft., and make alterations to the intake	85	0	0
Erect stacks at discharge end of A2, 3, 4, 5, and 6 similar to that of A1	354	0	0
Fix new type dust collecting hood over B3 machine	114	0	0
Make one spare bottom for the cyclones similar to that supplied to A6	42	0	0
Make new type bottom for A6 super hopper	63	0	0
Carry cost of concreting floor on east side of A section extending to No. 10 conveyor	251	0	0
Erect dust hood at the discharge end of B4 machine	78	0	0
Make and instal a dust hood at B6 machine	72	0	0
Alterations to A1 cyclone, D. & L.	32	0	0
Carry cost of stopping gas leakages in stacks, fans, and cyclones to 1/7/25	9	0	0
Instal a dust hood at discharge end of B5 machine, D. & L.	123	0	0
Instal sprays in B section vacuum chambers	81	0	0
Carry cost of erecting roof over No. 3 conveyor	135	0	0
Cover No. 7 conveyor similar to No. 3	20	0	0
Cost of installing screw on A2 and A3 machines	190	0	0
Instal a trough and water service at A5 and A6 cyclones, and altering chute of No. 6 cyclone to old type	25	0	0
Plate the floor of B section, D. & L.	178	0	0
Making and installing dust-catching attachment on A1, 2, 3, 4, and 5 cyclones similar to A6	85	0	0
Installing chutes on brickwork on A and B machines similar to B2	27	0	0
Covering No. 12 conveyor similar to No. 3 conveyor	64	0	0
Carry the cost of renewing and extending plates on the A machine floor	48	0	0
Instal experimental feeder at tray conveyor on D. & L. plant	321	0	0
Experiments in connection with water sealing of D. & L. cyclones	2	0	0
Erect extension nose on slag pot hoods to carry fumes away from overflow chute	36	0	0
Renew smelter charge watering down. Drainage trays, and put in suitable valve in pipe to sprays	22	0	0
Connect fresh water service with ¾in. tap to be fixed to steps at south-west corner of smelter baghouse for watering down purposes	6	0	0
Lay ¾in. fresh-water pipe on south end of baghouse, with taps between Nos. 1, 2, 3, and 4 chambers	11	0	0
Remodel slag pot hood on No. 2 furnace as arranged	67	0	0
Make and erect slag pot hoods for Nos. 1, 3, and 4, and south end of No. 2 furnace similar to hood north No. 2 furnace	820	0	0
Fix fresh-water taps between Nos. 3 and 4, 5 and 6 chambers, south end	6	0	0
Fix fresh-water tap on No. 1 floor at north end of bag house	3	0	0
Fix water sprays in D. & L. bin as arranged with Mr. Tonkin	38	0	0
Fix sprays in dross bin similar to those in H.-H. and D. & L. bins	12	0	0
Connect hydraulic water to existing pipes at the top of D. & L. and H.-H. bins, the valves to be controlled by the charge weighers; also alter direction of existing sprays as arranged	5	0	0
Make and erect slag pot hoods at both ends of No. 5 blast furnace	162	0	0
Connect hydraulic water with pipes leading to top of slag and coke bins respectively; also put taps in good order	20	0	0
Renew charge spray near coke bin, top floor, as arranged	15	0	0
Fix wash troughs and replace basins, and renew towel rollers in top floor and bottom floor, crib houses	58	0	0
All expenses in connection with experiments on ventilation of working places on bottom floor smelters	111	0	0
Costruct uptake in front of blast furnace as arranged with Mr. Ahern	106	0	0
Adjustments to uptakes in front of No. 2 smelter furnace	185	0	0
Fix two ¾in. hoses on dross platform at refinery	2	0	0
Change over the smoke hoods at present erected on No. 4 set of gas retorts to No. 1 set at refinery	76	0	0
Make provision for removal of fumes from retort furnaces at refinery, as advised by hygiene officer	304	0	0
Fix suitable pipes at refinery lead pans to charge in the lead, as advised	241	0	0
Connect flues from antimony dross furnaces into main stack	6	0	0
Erect at Cupel stack refinery one "sirocco" fan to deliver 10,000 cub. ft. of gas per minute, as arranged (This order is still open; it is being proceeded with)	15	0	0
Make 12 new dross pots for use in refinery	32	0	0
Fix hoods on all cupels at refinery after design prepared by Mr. Langstaff, and connect all hoods to main flue, as arranged with Mr. Dibdin	1	0	0
(The above item is still open.)			
Cover packing table in litharge mill with ¾in. plate	3	0	0
Enclose pulleys for twin belts at litharge mill to make them dust proof, as arranged	21	0	0
Erect hood on packing table to connect with fan to remove litharge dust from workmen	59	0	0
Construction of ¾in. water service to heaps and slag pit	35	0	0
Maintenance of repairs to ventilating pipes and valves at Ropp roasters	30	12	6
Maintenance and repairs to ventilating fan pipes and valves, Ropp roasters	15	0	0
Have belt of calcine loader covered to prevent wind blowing material off belt, also have a water spray put at end of belt at point of delivery	21	0	0
Overhaul elevator structure to prevent spillage	3	19	0
Minor experiments at Skinner furnace, tests on water atomisers	10	12	0
Erect hoods and flue for dust suppression at Barrier roaster furnaces	67	12	0
Make two watering down hoses each 60ft. long for hygienic department	14	0	0
Make one watering down hose 35ft. long	6	0	0
All expenses in connection with maintenance of watering down hydrants and equipment	223	0	0
Make frames for notices as per list, and put same in positions to be indicated by Mr. J. Murrie	18	0	0
Experiments in connection with vacuum dust catchers	4	0	0
Experiments with dust-catching by means of air suction at Skinner furnaces	154	0	0
Instal watering down hydrants where required at various places around works	558	0	0
Instal additional watering down hydrants as required about works	95	0	0

661. Are those figures which you have just read all the work, or are they samples typical of the work that has been carried on?—It is very difficult to get all the figures, but they represent the bulk of the work that has been done on ordinary maintenance.

662. Charged against maintenance?—Yes; against ordinary operating expenses. There is other work, such as the improving of the baghouse condition, which is a very expensive job, that does not come into this at all.

663. These are of the nature of the numerous similar items which are being carried out all the time, and are irrespective

of the big jobs such as the new baghouse?—Yes; or the bullion handling scheme and so on.

664. Is there a total made up?—There was a total, but I have omitted one or two items, and that would affect the total.

665. *By Mr. Robinette*—You have a sum total made up on the sheet?—Yes; there is a sum total.

666. Have you the totals made up on those sheets?—The total is there.

667. You intended to give that?—I did not. I did not intend to put these sheets in. They were not typed. It was just a matter of being able to quote examples of work done on the job. This was information got out in a hurry. All the items are correct, but there were some which I did not choose to put in. Therefore, the omission of them would affect the total; but what I have given is typical of what has been done on the works.

The witness withdrew.

WILLIAM ROBERTSON, metallurgist, 14, Marlborough Street, College Park, Adelaide, was sworn and examined:

668. *By Mr. Gepp*—Are you a member of any recognised institutions or associations of mining and metallurgy?—Yes. I am a member of the Institute of Mining and Metallurgy, London, and a member of the Institute of Metals, London.

669. What is your present position?—Consulting metallurgist to the Broken Hill Associated Smelters Proprietary, Ltd.

670. Were you not for a number of years in charge of the smelters at Port Pirie?—Yes; from 1897 to 1919, a period of 22 years.

671. Have you other experience in lead processes?—Yes. I have had 40 years' experience of lead smelting.

672. Where was this, in addition to your 22 years at Port Pirie?—I started as chemist and assayer with the Glasgow Smelting Company, which was engaged in the smelting of lead and silver ores at Glasgow. From there I went as chief chemist and assistant manager to the Mines du Nord Company's smelter in New Caledonia.

673. After leaving New Caledonia where did you go?—I returned to Great Britain, where I was appointed manager of a silver-lead refinery in London. From there I was engaged by the Broken Hill Proprietary Company as metallurgist. I proceeded to Broken Hill, and, after passing six months there, came to Port Pirie.

674. Were the smelters at Pirie operating when you came here?—What are known as the old smelters were operating. The blast furnaces in the position they are in to-day were being built. They were finished some time in 1897.

675. We may take it, then, that your knowledge of Port Pirie goes right through the life of the present smelting plant?—Yes.

676. How many men were working on the smelters when you were there?—The number has varied from time to time, but in the early days the number would be about 1,200. Of course, during the war period, we employed up to 2,500 men.

677. Was there much foreign labor employed in Port Pirie in those days?—No. Our men were mostly Britishers.

678. Were you working on the same kind of raw material as the smelters are now using?—At the start, no; but from 1900 you can take it that the ores treated were substantially the same as at present.

679. Was the process prior to 1900 similar to what it is now, or has it been improved?—There has been a gradual evolution as the result of experience.

680. Can you give us a few outstanding points in regard to this matter?—Yes. In 1897 the new blast furnaces were started, and the charge at first was composed principally of oxidised ores from Broken Hill, with only a small percentage of roasted lead concentrates. The smelting for a short time was a comparatively easy matter. However, shortly afterwards the quantity of concentrates sent from Broken Hill increased considerably.

681. By concentrates you mean sulphide concentrates?—

Yes. In order to put them in proper condition for smelting it was necessary to get rid of the sulphur. This was done by passing the concentrates through what were called Ropp roasting furnaces. These furnaces were what were known as straight-line furnaces. The concentrates were fed in at one end and gradually carried throughout the entire length of the furnace by means of rabbles. The necessary heat was supplied at first by four fire boxes situated at different points along the length of the furnace. These fire boxes were later substituted by gas firing. The feed end of the furnace was comparatively free from dust, as the concentrates fed in arrived from Broken Hill in a moist condition. But at the discharge end of the furnace the calcines were discharged in a red-hot condition into trucks, and a considerable amount of dust was raised. The hot calcines were trucked out into the yard and dumped.

682. Were they dry or wet at that time?—Dry. You could not water them down on account of them being red hot. From that point they were picked up by the charge wheelers, taken to the top floor of the blast furnaces, and dumped down on the charge plates.

683. The description you are now giving of the metallurgy at that date was the best known practice at that time?—Yes.

684. It was mainly due to the fact that prior to that date mostly oxidised ores had been treated—I refer to 20 years ago—and this was a new development, that is, the utilisation of such a considerable quantity of sulphide ores?—Exactly.

685. What you are describing is really the history of the treatment of sulphide concentrates by blast furnace methods?—Yes. From the charge plates the calcines, together with the other ore and fluxes which made up the charge, were shovelled into the furnace by the feeder man. The charge for a blast furnace ought to be in a fairly rough condition, that is to say, the size of the material charged should be from 6in. or 7in. downwards in diameter, and with a very small proportion of fines. That is the ideal condition. As the proportion of concentrates increased, and the oxidised ores decreased, we found that we had to smelt a charge with a very large proportion of fines. The result was that considerable trouble occurred in the blast furnaces. The charge, instead of smelting in the usual way, would hang up and cause scaffolds, resulting in blowholes, through which quantities of lead fume were discharged into the furnace shed around the feed floor.

686. And also dust to a considerable extent?—Sometimes, but on the feed floor there was more fume than dust.

687. By scaffolds do you mean accretions on the side of the furnaces?—It means that the ore started to smelt higher up in the furnace than it should, causing bridges to form from wall to wall. Firstly, we started with eight large smelters and one small one. These were estimated at the time to do all the work, but on account of the trouble we encountered in the treatment of the fine calcines we had to erect another four furnaces, making 13 in all.

688. What tonnage would those 13 furnaces treat under your then metallurgical methods and knowledge?—The quantity treated was very small indeed, as usually we would have at least 50 per cent. of them stopped for barring off, owing to the accretions and scaffolds that had formed from the fine ore.

689. Can you give us any figures of the yearly or half-yearly tonnages of these furnaces?—Not at that particular time.

690. The conditions you have described would mean a considerable number of men being around these furnaces for your output?—Yes.

691. Many more than now?—Yes.

692. In those days all the ore was tipped by hand into the open top furnaces?—No. It was tipped on the plates, and then shovelled in. The smelting conditions became so bad that it was pratically impossible to continue unless some new means was devised of treating the fine calcines before feeding to the blast furnace. Just about that time a machine called the White mineral press had been patented. It was really a briquetting

machine for converting fine ore into suitable sizes for blast furnace work. Three of these were procured, and the concentrates were passed through the roasters in the same way as before, except that a certain quantity of shell or crushed limestone was added to the charge. A proportion of this lime material was converted into sulphate of calcium, which had a certain setting power, and when the mixture of calcines and sulphate of calcium was put through the briquetting machines, the briquettes formed, after standing for two or three days, became fairly hard, and were in a much better condition for smelting than the fine calcines had been.

693. It was moistened before briquetting?—Yes.

694. That caused the dehydrated calcium sulphate to take up the moisture and set?—Yes. The conditions at the discharge end of the roasters were not improved, as the hot ore was taken out in the same way as before, but the handling of the briquettes from the bottom floor to the smelters was considerably improved so far as dust was concerned, there being practically no dust in this connection. The effect on the smelting itself was considerable, as we were able to run the furnaces over a much longer period without barring off, and there was certainly a considerable reduction of fumes on the feed floor.

695. Will you proceed with your history of development on the smelters?—In 1900 the Broken Hill Proprietary Company, Limited, put in a number of baths, 16 in all, to find out if they would be appreciated; if so, they were prepared to erect proper bathing and change-house accommodation. The result, however, was very disappointing. In the first year only 2.4 per cent. of the men used them, and the numbers gradually decreased until only two or three men a week used them. Then they were closed. The baths were provided with hot and cold salt water and cold fresh water, with cubicles for the men to undress in, and a man was in attendance to keep the place clean, &c.

696. What was the next outstanding development that you remember?—Though the briquetting system was a considerable improvement, it yet left much to be desired, and in 1902 a process was brought under our notice called the Huntington-Heberlein process, which is usually referred to as the H. & H. This process treats the partially calcined concentrates, burns off part of the remaining sulphur, and agglomerates the fine ore; that is, converts it into lump form.

697. That is the form which you previously mentioned was desirable for blast furnace feeding?—Yes. The concentrates were pre-roasted in the Ropp furnaces as before, with the addition of suitable fluxes and crushed ironstone and limestone. The partially roasted material was taken from the discharge end of the furnaces, elevated to a platform running parallel and higher than the Huntington-Heberlein kettles. In the days gone by the conditions were slightly different from what they are now. The hot material from the roasters was dry and fine, and was tipped from a height of about 4ft. into the kettles along a chute, and there was at times considerable dusting. The process itself was not as efficient as it is now when we are treating pre-roasted material from Dwight & Lloyd machines. The matrial was not so well cooked as at present, and very often very large quantities of only partially cooked material existed in the agglomerated lump when tipped, causing a considerable quantity of dust.

698. That is, by the feeding of fine material into the pots instead of the pre-roast as now, the agglomeration and sintering were not so successful as at present?—That is so.

699. Therefore, the dust was greater when tipping?—Yes. The effect of this Huntington-Heberlein material in the blast furnace was considerable. We were able to put a much larger tonnage through the furnaces than before, and conditions on the feed floor were considerably improved. The rate of smelting was such that we were able to close down two or three of the 13 furnaces I mentioned.

700. What was the date of the introduction of the Huntington-Heberlein process?—It was in 1902.

701. What is the next date that you desire to mention?—Up till 1904 the blast furnaces were of the type known as open-top furnaces. The size at the top was practically 20ft. long by 6ft. 6in. wide; this was partly covered over with iron plates, leaving an opening over the centre of the furnaces of about 2ft. 6in. by 13ft. long. The gases were taken off from immediately under these floor plates by means of a downtake, and delivered into the main flue.

702. Was that by natural draught of the chimney?—Yes.

703. Was it the same chimney as is there now?—Yes. The charge, consisting of the Huntington-Heberlein material and other leady materials, together with the necessary fluxes and slag, was tipped on the plates around the opening, and from there fed in by hand. To obtain good smelting results it is necessary that the ore and fluxes should be evenly distributed in the furnaces, and it is obvious that with the dimensions, 20ft. by 6ft. 6in., it would be rather difficult for a man to do this correctly; so at that time what was called central uptakes were introduced. The plates covering the top of the furnaces were removed, and an oblong flue was let in the top of the furnace for a distance of about 3ft. That flue was of such dimensions that it left from 18in. to 20in. clear space all round the furnace top. In those days the uptake was slightly different from the present one. It rose straight up for a distance of about 12ft. to 14ft., then took a gooseneck form and entered the main flue, thus taking the gases off from the top of the furnace. The feeder man, instead of having to distribute his charges over the space already mentioned, had only this opening around the furnace of not more than 20in. wide in which to place his charge. The charge was usually kept up whenever practicable nearly to the level of the feed plates, thus forming a sort of seal, and preventing a lot of extraneous air from entering the top of the furnace. The outcome was that we obtained a much better smelting result, and, what is more, the amount of fume thrown out by the furnace previously was again considerably lessened, and we have run over considerable periods without any smoke being seen on the feed floor at all, except on such occasions as when a furnace was being run down for barring. Of course you will understand that so far these improvements have only been in relation to the feed floor. The next improvement was the introduction of turbo-blowers; that was in 1907.

704. What did you use before that?—We were using the Green blower.

705. Was that a reciprocating blower?—It was a pulsating blower of the Roots type.

706. At approximately what pressure did you work with the Green blower?—We got up to 26oz. Previous to that we were using a very inferior blower, which could give a blast pressure of only 15oz. to 18oz. I will explain the reason why we had to get the turbo-blowers. The furnaces when originally built were 16ft. high. After the Huntington-Heberlein plant was put in we increased the height of the furnaces by 4ft. That is to say, we had an additional 4ft. of ore column in the furnace, and naturally with that increase the amount of resistance to the blast was considerably increased, and we were not able with those blowers to get the requisite quantity of air through the furnace to effect a proper speed of smelting, so we installed turbo-blowers.

707. *By the Chairman*—Does your reference in ounces to the pressure of a blower mean ounces pressure over atmospheric pressure?—It means ounces per square inch over atmospheric pressure. These turbo-blowers were capable of giving a pressure up to about 80ozs. at that time.

708. *By Mr. Gepp*—When were these turbo-blowers installed?—The installation started in 1907.

709. They were the original Parsons type?—Yes.

710. Are those the type you now use?—No, we use the Rateau.

711. Those are a further improvement over the original Parsons?—They are from a mechanical standpoint.

712. What pressure does these deliver?—Speaking from memory, they would deliver up to 80 ounces, but that pressure we never use. We found that from 44 up to occasionally 55 was all that was necessary. The usual pressure is in the neighborhood of 48 ounces.

713. Would that improve the speed of smelting?—Considerably. We were able to put out of commission a great number of other furnaces.

714. The furnaces were of the some general design as they are now?—Yes, but there have been minor alterations made from time to time, as, for example, in the early days the furnaces were wider at the tuyeres than they are now, and the tuyeres projected into the furnace about eight or nine inches.

715. The furnace now is a further improvement on that?—Yes. The size and shape of water jackets have changed from time to time and there have been other small alterations of that character.

716. How did you take the slag off in those days?—The slag was tapped from both ends of the blast furnace, passing near a short chute and flowing into slag pots. In the earlier days there was comparatively little smoke given off from the slag, and at Broken Hill when running on an acid slag running 40 per cent. of silica, there was practically no fume given off at all.

717. That is with high silica in the slag?—Yes. Here in Pirie in the earlier days the quantity of zinc in the ore was comparatively small and we were able to run with a slag running about 28 per cent. of silica. With this slag, as previously stated, there was not an abnormal quantity of fume given off, but as the zinc increased in the ore, it was found necessary for smelting reasons to reduce the silica in the slag and the basic slag formed gave off quantities of fume. This became so bad that it caused sickness or plumbism amongst men, not only on the bottom floor off the furnace, but in my opinion throughout the works generally, depending of course on the direction the wind was blowing. One part of the works would suffer more at one time than another part would. To overcome this we introduced hoods. We tried several forms at first, but eventually settled on the hood which I think was the same as in use to-day. The slag tap was covered, also the slag pot into which the molten slag was being run.

718. In what year were they introduced?—1909, in September or October.

719. *By Mr. Robinette*—Were the works in operation at that time?—Yes, that was after the strike, or, as some people call it, the lockout. I think we started up in June. These hoods proved very effective, and removed all the smoke and fumes clear of the building.

720. *By Mr. Gepp*—During the period you have been describing, that is, from 1900 to 1910, on the metallurgical side was the assay of lead in the slag about the same as it is now?—Up to 1902 the lead contents of the slag would be higher than they are now, that is until we put in the Huntington-Heberlein process. The roasting was very incomplete in the Ropp roasters, both when we were using calcines direct into the smelters and also when the briquetting plant was working. The result was that fairly large quantities of matte were produced. This had to be crushed, roasted, and re-smelted. That, of course, has been done away with for a number of years by better roasting practice.

721. What is the next point you wish to bring forward?—In 1909 we erected a baghouse in order to catch the fume given off by the blast furnaces.

722. Mr. Somerset described the practice now. Was that the same type of baghouse as exists now?—The baghouse itself was the same.

723. Was it worked by mechanical means?—Not altogether. The bags were shaken mechanically, but the material collected in the bags fell into a chamber underneath, until the fume had collected to a depth of between 5ft. and 6ft. The fume entering that particular chamber was then shut off and several of the bags undone from the nipples on the floor so as to leave a vent for the smoke. The fume would then be set alight by means of a few firesticks and allowed to burn in the chamber. During that time we would not be able to use the chamber. When the fume had all burned and cooled off, men would go into the chamber, load it, and stack it nearby for the charge of wheelers to take it to the feed floor. That was certainly a most objectionable job.

724. The men had to break up this stuff?—It was fairly friable and a pick would bring it to pieces.

725. They had to pick it down from the burnt heap?—From the five or six feet heap the fume would be reduced in height to about 18 inches or two feet. The baghouse has been improved on since. The bags when shaken now deposit the fume into a sort of trough and at periods this fume is drawn off by means of a screw conveyor and discharged into trucks. These trucks are removed to a burning house where the contents are set alight and burnt in the same way as was previously done in the chamber itself, this obviating the handling of burned material by manual labor.

726. Is there any other point you wish to make regarding the story of the baghouse development?—Yes. The fume smoke delivered to the baghouse is drawn off from the top of the blast furnaces by means of a fan. The draught being mechanically produced is much stronger, and, of course, is constant, while the natural draught caused by the chimney varies considerably, depending on the difference between the temperature of the gases going up the stack and that of the outside air. The hotter the atmosphere the more sluggish is the draught. In summer this is accentuated, and at times in the summer the natural draught is very poor. In fact on some hot days in summer I have known there to be a down draught instead of an up draught in the chimney. That happened on several occasions, and we had to put a fire at the bottom of the chimney so as to increase the temperature of the ascending gases in order to create a sufficient draught. Of course the draught caused by the fan is constant. This tends to minimise the amount of smoke that may escape on to the feed floor. There is another point in connection with the baghouse, and that is that the men who had to go into the baghouse to repair the bags and stop leaks were provided with overalls and respirators. They were also allowed time in the Company's time to have a bath when they had finished their work.

727. You have dealt with the baghouse question and the date you give as the time this was installed in 1909. Will you go on now with the chronological history?—Yes. Until 1911 the charges for the furnaces were all fed to the furnace mouth in charge barrows drawn by men. When a furnace was running in good order it would take 11 men a shift to bring the charges for one furnace. It varied sometimes, as if the furnace were not running to speed the number would be fewer. You can take the average as 11 men. The number of men on the feed floor when we had seven or eight furnaces running rendered the feed floor congested. There was no room. We went into the matter very carefully, and a mechanical feed arrangement was evolved, which was practically the same as that now being used. The only difference is that now it is automatic both ends. In those days we used to have one man per shift at each end of the feed, so as to manipulate the levers which regulate the gear for bringing the trucks from one set of lines to the set of lines for the furnaces. The result of the installation of the feed was that we were able to do away with practically 200 men. Although the mechanical feed itself did not alter the position so far as fumes or dust were concerned, the number of men exposed to any risk was lessened by 200.

728. For 14 years the furnaces were fed by hand, and from 1911 they have been fed mechanically?—Yes. The mechanical feed also did away with the heavy work of feeding the furnaces by hand.

729. Have you any other points to make in regard to the blast furnaces or will you now describe to us any further im-

provements made in regard to roasting?—Prior to 1912 a new method of de-sulphurising sulphide ore concentrates was brought under our notice, namely the Dwight & Lloyd process. After experimenting on a small machine we came to the conclusion that the new process would be an improvement on the Huntington-Heberlein. In 1912 the Dwight & Lloyd plant was put in. Of course, like all new plants it gave us considerable trouble at first, but gradually this was overcome, and for some time past the plant has been giving good results.

730. In your opinion does the new plant on the Dwight and Lloyd compare favorably in design from the health standpoint with the one that was burned down in 1921?—Yes. It is considerably better. The working conditions and ventilation are much better, and there is far greater freedom from dust. In the first plant put in, we used disintegrators for breaking up the pre-roast, and when first put in they caused a considerable quantity of dust to escape into the building.

731. What are now used?—Rolls, and these make much less dust. The first disintegrators we put in were fairly close to the machine, and the material could not be wetted down properly before it got to the disintegrators. The result was that part of the material was dry, and as the two cages of the disintegrators in revolving created a strong current of air, naturally the very fine dust was lifted into the atmosphere. Another improvement effected in the Dwight & Lloyd plant on the A machines is the elimination of the rolls that used to be immediately under the discharge end of each machine. This gave a preliminary crushing to the pre-roast as it fell from the machine. Here again a certain amount of dust was created because of the inability to moisten the hot stuff prior to it entering the rolls. These have now been done away with, and on No. 1A machine an arrangement installed which has been running now for some time on trial, and in my opinion has almost eliminated the dust from that part of the plant.

732. That is the screw feeder?—Yes.

733. Are there not other directions in which improvements have been made as a result of experience and discussion with people in other countries; for instance, the adoption of the trail gate has helped to reduce the amount of work in cleaning?—Yes. Prior to the adoption of the trail gate, which is a rocking grate, we used a straight line grate. That grate was a fixed one, and the openings in it were at right angles to the long axis of the grate. These openings used to fill up with sintered ore, which had to be chipped off by hand, making a certain amount of dust. Other improvements have been introduced there since I left, namely, sprays under the vacuum boxes, whereby all the dust that passes through the grates is moistened before being drawn out. Sprays have been introduced also to cyclones with the same object, and the ventilation has been enormously improved. In the old plant on the A section the machines were practically closed in. Now they are open to the atmosphere.

734. Do you approve, from the point of view of health conditions, of the efforts that Mr. Somerset described for the final elimination, as far as possible, of the Huntington-Heberlein process?—Yes. If the Huntington-Heberlein pots are tipped hot a certain amount of fume is given off. I understand arrangements have been made to cool them back till they are nearly black, and water the dust on top of the pot before tipping. The down draught process in the Huntington-Heberlein kettles has been entirely stopped. That, in my opinion, was a dangerous part of the works.

735. On your recent visit were you able to study the very recent improvements in the way of the deepening of the bed on the Dwight & Lloyd machines?—I have not seen it in any other part of the world. I have seen it here.

736. Does that indicate further improvement, and the elimination of more Huntington-Heberlein work?—Yes.

737. What other points in your survey of the history of the works would you like to mention?—It is very difficult for anyone who is not a metallurgist, or has not been connected with lead smelting for a number of years, fully to appreciate the improvements I have mentioned. To put it in a way more easily understood, at present there are six furnaces running there treating a certain tonnage of ore material. If we had to revert to the conditions existing in 1900 we would require 25 furnaces to do the same tonnage, with a much inferior result. These are actual figures which there is no getting away from. One can only imagine what the state of the place would be with 25 furnaces running as in 1900, with prabably 50 per cent. of them smoking.

738. Have these improvements, in your opinion, also improved working conditions?—Undoubtedly. I think the two things go hand in hand. Whenever new designs were under consideration the utmost importance was attached to the working conditions.

739. Are the works in a better shape now from the health hazard point of view than, say, 10 years ago?—Undoubtedly.

740. Did you have any reported cases of lead poisoning under the Workmen's Compensation Act 10 years ago?—No.

741. Was there any evidence of plumbism?—Yes. Occasionally when a man had been away sick, on returning to work he would produce a doctor's certificate saying that he had been suffering from plumbism.

742. Have you any idea of the number of such cases?—No. No records were kept at the time.

743. Do you know how the number of reported cases has grown since 1917, particularly since 1923?—Yes.

744. Can you suggest any reason for that increase?—I have noticed from returns that the reported cases occur principally among foreigners. It may be that the change of climate, of food, and of occupation, and the general conditions under which these people live, render them more susceptible.

745. Do you remember the inquiry made by Dr. Ramsay Smith in 1910 touching on lead poisoning at Port Pirie?—Yes.

746. You were in charge of the smelters then?—Yes.

747. Did you give evidence at that inquiry?—Yes.

748. Do you remember the recommendations made by Dr. Smith?—Yes. He made two recommendations. The first stated that "the recent action of the company had enormously reduced the number of cases, but I think it would be well, as suggested by the manager, to draw up a set of instructions to the workers, advising them how to take advantage of the facilities provided, and how to attend to matters of personal health and habits, so as to avoid those dangers that are inseparably connected with their health and livelihood." The second read:—"Although it has been found necessary in other places to introduce legislation making certain precautions compulsory on the part of the workers as well as the employer, I do not advise such procedure unless it should appear that cases of lead poisoning still continue to occur on account of the negligence of the men themselves."

749. What did Dr. Smith refer to by "recent action of the company?"—The hoods that had been put over the slag taps and slag pots some months before.

750. Dr. Smith estimated that during the previous three years, 1907-1909, there has been between 150 and 200 cases of lead poisoning. Was that an estimate? He had no figures to guide him?—The only figures he could get were from the medical men who gave evidence.

751. What was thought to be the danger spot?—The slag taps and pots, and they were hooded over and the fume carried to stacks clear of the building.

752. That is what is meant by "the action which had enormously reduced the number of cases?"—Yes.

753. From 1910 onwards was this improvement maintained?—Yes. We had only occasional reports from the doctors, but no claims for compensation.

754. Was lead poisoning compensable in those days?—Yes. The clause referring to lead poisoning came into force on January 1, 1912, the Act having been passed the previous year.

755. You had every reason to believe that with the improvements made the health hazard was not very great?—Yes.

756. Did you let it go at that?—No. Throughout the period

of my association with the works better treatment methods and better working conditions have been steadily evolved, and since I left the works the same course has been pursued.

757. As consulting metallurgist to this company, how often do you visit the works?—About every three months.

758. Do you keep in touch with what is being done?—Yes.

759. Can you offer any definite theory about the increase in reported cases of plumbism?—No. Considering the great improvements that have taken place recently, both metallurgical and in the general conditions of work, it is incomprehensible to me how there should be such an increase.

760. When did you last visit Europe and America?—In 1919.

761. Did you inspect any plants comparable with the Port Pirie smelter?—Quite a number.

762. How long did you spend on that trip?—A year.

763. What are the names of some of the smelters and refineries you visited?—I inspected the St. Joseph Smelting Company's plant in Missouri, the Federal plant in Illinois, the St. Louis Smelting Company's plant in Missouri, the Omaha Refinery in Nebraska, the Globe, the Pueblo, the Salida, and the Durango plants, all in Colorado, the Selby plant in California, the Murray, the Midvale, and the Tooele plants, all in Utah, the East Heena plant in Montana, the Bunker Hill and Sullivan plant in Idaho, the Trail plant in British Columbia, the International Refinery in Indiana, the Perth-Amboy Refinery and Balbach Refinery in New Jersey, Cookson & Son's plant, the Enthoven Refinery, and the Lock, Lancaster Refinery, in England. I also inspected the Pennaroya plant in Spain, and the plant of the Societe de l'Escalette in France.

764. What is your view of the Broken Hill Associated Smelters at Port Pirie as compared with the generality of these plants from the standpoint of health conditions?—I saw no place where the working conditions were better, where there was a greater freedom from smoke or dust, or where the ventilation was better than the Port Pirie smelters. In works in the United States and Europe the ventilation cannot possibly be as good as it is here, as owing to the rigors of winter in those countries most of the plants are all closed in. In fact, some of them are built of stone and brick.

765. Do you know of any special conditions that are imposed on this industry in those countries in regard to regulations of law and codes of rules?—I know that in Great Britain there are regulations governing the lead industry.

766. How do you know of those regulations?—I have read extracts from them.

767. What do they provide?—For the elimination, as far as practicable, of all factors making for health hazards. They provide for proper medical supervision, and then require the recognition of all concerned of the importance of certain precautions whilst at work.

768. In your evidence at the 1910 inquiry you favored the application of a code of rules having statutory force covering the precautions to be adopted by all concerned to minimise the health hazard. Do you still adhere to that view after your further experience of another 15 years?—I most certainly do, and I think the rules and regulations ought to be made compulsory.

769. On both the company and the man?—Naturally.

770. Would you say regulations similar to the British regulations could with advantage be adopted?—Yes. I think regulations somewhat after the lines of those in force in Great Britain would prove beneficial here. Of course, in the framing of those regulations or rules, local conditions require to be taken into consideration, but I think the general principles of the British regulations would be applicable here.

771. In the labors which the Commission has undertaken, if there is any further assistance you could give in connection with the problem facing us, you would be glad to give it?—I would be only too pleased.

772. There was a zinc distillation plant under your control during your regime?—Yes.

No. 57.

773. In that connection there was a zinc roasting plant?—Yes; called the Haegler roasting plant.

774. It carried out the same operation, in a somewhat different way, as the Skinner furnaces?—Yes.

775. Where was it situated?—On the present site of the Skinner plant.

776. What tonnage did it treat?—About 40 tons a day, probably a little more.

777. Can you make any comparison of conditions there then with conditions now?—The Haegler roasting plant was a straight-line double furnace, consisting of two tiers of seven superimposed hearths in each. There was considerable dust from the elevators handling the dried concentrates to the furnace, but the dusting from the furnace itself was exceptionally bad. Every time a rabble passed a hearth it brought out with it a certain amount of calcines, which were blown about the building, and also every time a charge dropped from a hearth to the one underneath a quantity of dust was projected through the front door of the furnace into the shed. The calcines were not wetted down, but were fed direct from the furnace into trucks, run out, and tipped in the yard, causing more dust. In fact, the dust in that plant was so bad that the workmen had to be provided with goggles to keep their eyes clear.

778. Was the material that was roasted in there of approximately the same composition as now?—Practically.

779. Mr. Somerset gave us the average of the raw material put into the zinc roasting plant as about 5.5 per cent. lead. The material would not be any lower in lead than in former days?—It used to be 6.7 per cent. of lead.

780. *By Mr. Robinette*—What was the blast that was on the furnaces in 1909?—From 44ozs. to 48ozs.

781. What was it in 1897, or soon after the smelters started?—From 16ozs. to 18ozs.

782. What is it at present?—My impression is that it runs in the neighborhood of 44ozs. I am not certain of that figure.

The witness withdrew.

HENRY ST. JOHN SOMERSET, general superintendent, Broken Hill Associated Smelters, was recalled and further examined:

783. *By Mr. Gepp*—We were not quite clear where the compounded cases show in the various tables?—When a case is compounded it is on the basis of a doctor's estimate of the period of disability. If a man has been in receipt of compensation, and is then compounded, he is shown in the table submitted in the period column, which represents the total of the time during which he has received weekly payments, plus the period of further disability estimated by the doctor. For instance, a man may have been drawing compensation for three months, and then have been compounded on the basis of six months' further disability. In the tables he is shown in the nine-months' table. Also, a man compounded as permanently incapacitated is shown in the last period column in the table.

784. We have not yet had a definition in regard to the meaning of permanent incapacity. Does it, as far as you know, indicate complete inability for any other work for ever afterwards?—It would be best to get the meaning from the doctors. I could not define it in the sense doctors use it.

785. In your evidence you gave it as your considered view that certain regulations having statutory force should be imposed. You stated that it was decidedly unfair for regulations to apply only to the employer and not to the employee, and that unless both parties were bound by law to the observance of approved rules the health hazard could not be overcome, nor should the whole responsibility for industrial disease be laid at the door of the employer. Do you recollect that portion of your evidence?—Yes.

786. What regulations had you in mind, and where have they been made applicable?—Taking the question of smoking and using tobacco for chewing whilst at work. A regulation in

force in Victoria is as follows:—"No person shall chew tobacco or take snuff whilst employed in a lead process." Regulations under the Indian Factories Act prescribe, *inter alia*, that no persons employed in a lead process shall bring into or consume tobacco in any room in which the process is carried on. The German regulations include a similar prohibition. Regulation 20, paragraph 4, contains it. The English regulations include the following:—

Regulation 15. No person employed shall introduce, keep, prepare, or partake of any food or drink (other than a non-alcoholic drink approved by the surgeon), or make use of tobacco in any place in which any lead process is carried on: provided that except in processes named in regulation 8 (*e.g.*, clearing of flues or condensers, demolition of furnaces, &c.) this regulation shall not prevent any person from using tobacco other than cigar or cigarette if his hands are free from lead.

I have quoted this regulation in full, but in my opinion the proviso included vitiates the regulation, and I should say from my practical experience over many years in control of men that it would be impracticable to give effect to such a proviso. To amplify that, I should say it is obvious that in those places where a respirator has to be used it would be impracticable to allow smoking, and obviously it should be absolutely forbidden.

787. What about medical examinations?—Regulations providing for compulsory examination are a common feature of the industrial legislation dealing with lead processes. Regulation 13 in Great Britain provides:—

Every person employed in a lead process shall be examined by the surgeon once in every calendar month, or at such shorter or longer intervals as may be prescribed in writing by the Chief Inspector of Factories on a date of which due notice shall be given. A health register containing the names of all persons employed in a lead process shall be kept in a form approved by the Chief Inspector of Factories. No person after suspension shall be employed in a lead process without the written sanction of the surgeon entered in the health register.

Legge & Goadby, the standard British authority on lead poisoning, lays great stress upon the prevention of plumbism, and the importance of not employing persons unsuitable physically for the industry. It also emphasises the importance of regular medical supervision of the employee from the time he enters the industry. The report of the New South Wales Board of Trade, 1921, on the painting industry, is also emphatic in these regards. In France regulations 15 and 16 state:—

No worker may be permitted to undertake any work as contemplated in regulation 1, unless provided with a certificate issued by the medical man to the effect that he shows no symptoms of lead poisoning or of any illness which is liable to be dangerously aggravated by lead poisoning. No worker shall be kept on the same class of work unless the certificate is renewed one month after engagement, and afterwards once a quarter.

788. Does regulation No. 1 cover work in lead factories?—Yes. German regulation No. 17 states:—

The medical officer shall examine every worker before engagement, and at the same time shall inform him of the danger of lead poisoning. Only those workers shall be engaged in respect of whom the medical practitioner declares there is no predisposition to lead poisoning.

The Indian regulations say:—

The persons employed must undergo the prescribed medical examinations at the prescribed intervals, and the prescribed record must be kept with regard to their health.

Regulations in force in Missouri, U.S.A., are to the effect that every employee engaged in a lead process shall be examined by a competent, licensed, and reputable physician as often as once a month, for the purpose of ascertaining if there exists in any employee any industrial or occupational disease or illness, or any disease or illness due to or incident to the character of the work in which the employee is engaged.

789. What regulations can you quote in regard to personal cleanliness?—Section 48, paragraph 5, of the Mines and Works Regulation Act of New South Wales, for example, is quite specific. It states:—

Every underground workman shall change his ordinary clothes for working clothes in the change-rooms before descending to his work, and shall change clothes again on finishing work and before leaving the mine. Surface workmen engaged in smelting or otherwise handling lead ores shall also make the same change of clothes.

The British regulations require that every man shall wash the face and hands before taking food, and before leaving the premises shall wash the face, neck, and arms. I believe that a bath once a day is desirable for everybody, not alone a lead worker, and that the lead worker, that is the man engaged on operating work or the maintenance work that brings him into touch with such operations, should bathe at the end of his day's work.

790. Are there any other rules that you have in your mind?—Yes. Simply, with regard to respirators, I think it is imperative that these should be used in all places where their employment appears to be desirable. As I mentioned before, had we the advice of a doctor in this matter, we would take him into consultation in this regard.

791. The regulations you have quoted cover laws passed by Great Britain, France, Germany, India, and some of the States of the United States of America, and all seem strongly to advise a similar action to be taken in these great smelting works in Australia?—One must assume that these regulations were framed after very close examination and investigation of the conditions that exist in the various processes connected with lead manufacture or in the use of lead compounds. One must be impressed by the fact that there is a great similarity in all the regulations, and that consequently all investigators have come to practically the same conclusion in the matter; and it is for that reason that I think they must be of benefit if applied in this industry also.

792. These regulations are administered by departments of the British Government and similar departments in other countries?—Yes.

793. Do the workmen in the countries mentioned heartily co-operate with the employers in carrying out these regulations, or does the contrary prevail?—I have not heard anything either way.

794. Nothing has come to your knowledge in regard to disputes between employers and employees?—No.

795. *By Mr. Robinette*—Do you know whether in any of the countries you visited compensation was paid to men who had been eliminated from the industry in accordance with the regulations you mentioned?—In no place in America is that the case. I think it is done somewhere, but am not certain. I will look the matter up.

796. You mentioned that respirators should be worn where desirable. On what parts of the works do you consider they are desirable or practicable?—I could not indicate largely. It depends on the nature of a man's work on a given day. On some days a certain place is quite good; on other days the prevailing wind make it less desirable to work in. I would be very largely guided by the advice of a doctor, if it were available.

797. Would it be practicable to wear them, say, near a zinc pan in the refinery?—Yes. If they desire them there they can have them.

798. Would it be desirable to wear them there?—I should not think so.

799. Could a man work with them on?—Yes. There has recently been introduced a new type of respirator, about which possibly you have no knowledge, as you have been so busy on the Commission's work since the time it was introduced. This respirator is stated by the men to be very much easier to wear than those forms we have previously tried.

Mr. Gepp (to the Chairman): In explanation I may say that after much experimentation this type seems to be by far the most generally applicable and simple respirator, consisting of butter muslin, including sufficient layers of cotton wool for the purpose. They are comfortable and easy to wear. One or two are used per day and discarded.

800. *By the Chairman*—As to working hours, is it a fact that the works are in operation 24 hours a day and seven days a week?—The operating section of the works, that is, the section

that is directly concerned in the process of lead reduction and manufacture, is operating for seven days a week on all three shifts, but the service department work in the main only six days a week.

801. What are the arrangements made for men to work seven days a week? What weekly day off are they allowed, and so on?—It is simply the usual method of changing shifts. In one week a man works what is called quick shifts. He works two eight-hour spells, with a spell of eight hours between, whereas in the other case he has a long period off. A man might be working on a day shift to-day, and go home and rest for eight hours, and come back on night shift. On the long shift off, on the contrary, he gets 32 hours off.

802. *By Mr. Robinette*—The man works eight shifts one week, seven the next, and six the next?—Yes. That averages seven shifts a week for all shift workers.

803. *By the Chairman*—Is the working of seven shifts a week desirable from the point of view of health?—From that standpoint I should say it is not desirable for a man to work every day of the week all the time.

804. In the event of this Commission making any recommendations on that subject, I presume the company would co-operate to improve the health of the workers?—Yes. The company would do whatever it could in that regard. In some departments it would be more difficult to arrange than in others, but if it were made an instruction we would naturally have to provide for it in one way or another.

805. *By Mr. Robinette*—When was the holiday bonus system introduced?—In 1918.

806. Might not that system lead to an increase in the number of cases of lead poisoning, through being an incentive to a man to overtax his strength?—I do not regard it in that light at all. A shift man, for example, is allowed to lose 16 shifts during the year from causes other than accident or sickness before his holiday bonus is affected.

807. Might it not be an incentive for a man who is not fit to get out of bed and go to work when otherwise he would not go?—He has 16 such occasions on which he can stay at home without affecting the bonus.

808. Supposing he had already missed 14 shifts?—In such case it is just possible that what you suppose might happen.

809. *By Mr. Gepp*—Have you ever tried six shifts a week on the plant?—Only in the power house, although I understand it was done at one time in the refinery.

810. Can you tell us anything in regard to the practice in the power house, and if it has been discontinued, the reason why?—It was put in originally at the request of the F.E.D. and F.A. Union officials, made before Mr. Justice Higgins to me. After it had been in operation for a little while I was asked to discontinue the practice of working the employees in that department six days a week only.

811. By whom were you asked?—By the secretary and executive of the organisation in Port Pirie. I informed them that, having made the promise before Mr. Justice Higgins that I would agree to the union's request, I would not discontinue six shifts in the powerhouse unless I had a written request from the union officials to that effect. The request was repeated to me on several other occasions, but on no occasion was the written request preferred until a time perhaps about two years after the introduction of the roster system, we got the request in writing from the union secretary, and the roster system was, at their earnest request, discontinued in favor of seven days per week per man.

812. Does that indicate a desire to earn more money by working more hours in the week?—Yes.

813. The request by His Honor was in connection with the question raised by the chairman, one day's rest in seven as a contribution to health?—It is obvious that it has been in the minds of the Arbitration Court Judges to discourage the working of seven days a week as much as possible, because we are penalised by overtime for working on the seventh day, the Sunday.

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814. Sunday is always overtime?—Yes; for shift men time and a half, and day men double time.

815. *By Mr. Pearson*—You referred just now to the regulations respecting the State of Missouri. What important lead plants are there in that State?—It was only at the Herculanean smelter that I heard about compensation being compulsory. The full compensation is the same as we now have, £700.

816. In giving tables the other day for the two half-year periods in 1924, you gave the number of certified cases of lead poisoning as 103 and 131, making a total of 234 for the year. Will you supply information as to the department in which those cases contracted the disease?—I will do so.

The witness withdrew.

The Commission adjourned.

Monday, May 4, 1925, at 10 a.m.

[At Congregational Hall, Port Pirie.]

Present—

Dr. K. R. Moore (Chairman).
Mr. H. W. Gepp.
Mr. J. L. Pearson.
Mr. W. Robinette.

WALTER HEWART JUDE, Afford Road, Port Pirie South, secretary of the Broken Hill Associated Smelters' Accident Fund, was sworn and examined:

817. *By Mr. Robinette*—When were payments for industrial sickness first instituted in connection with the fund?—On March 19th, 1923.

818. Prior to that they were not classified as industrial cases?—No.

819. Have you any figures as to the number of lead poisoning cases prior to that?—I have not any definite record of the number of lead cases prior to March 19th, 1923. I have made out a statement showing the total number of claims admitted by the fund, in respect to which the persons received compensation from the company, covering a period of six years and two months to March 11th, 1925. It is as follows:—

Statement showing total number of claims in respect of lead poisoning for which compensation has been paid, and which have been admitted, for period of six years and two months ended 11/3/25, also the average absence per beneficiary, and benefits paid:—Number of claims, 277; total time lost, 25,545 days; average time lost by each beneficiary, 92 days; weekly benefits paid during the period (total), £3,675 8s. 9d.

820. How did you arrive at the average time lost by each beneficiary?—By dividing the total time lost by the number of beneficiaries.

821. In arriving at that number of days did you count the time which the men were paid when they were compounded? For instance, there was a lump sum up to £52 paid to a man when he was compounded by the company. Did you include the difference between the £52 and what he had already received in making out your statement?—No.

822. Could you give the various yearly or half-yearly periods indicating what was paid in respect of industrial disease from the start of such payments?—I have not the information with me at present, but it could be got out if the Commission desired.

823. Have you the last balance-sheet?—No; that also I could get if it was wanted. I have balance-sheets for the two half-yearly periods ended 8/7/24 and 9/1/25.

824. What was the total amount paid for industrial sickness in that period of 12 months?—£2,359 17s. 7d.

825. *By Mr. Gepp*—Is that in respect to sickness generally or plumbism only?—That represents industrial sickness only.

826. *By Mr. Robinette*—What was paid in respect to industrial sickness for the previous five years?—£1,315 11s. 2d.

827. *By the Chairman*—Will you obtain for the Commission the various half-yearly balance-sheets?—Yes.

828. *By Mr. Robinette*—Have you any figures showing increases in industrial sickness which have taken place covering

those half-yearly periods?—I have not them with me, but I will get them.

829. What other figures have you to put before the Commission?—The only other figures I have compiled in statement form embody general information as to the activities of the Fund and alterations in the amount of benefits that have taken place. (Put in and marked Exhibit 6.)

830. Is there any other statement which you wish to make to the Commission that would assist us in regard to the incidence of plumbism in Port Pirie?—Not apart from what has been asked for.

831. *By Mr. Gepp*—You have a book of rules of this accident fund?—Yes. (Put in and marked Exhibit 7.)

832. This book of rules gives in more detail the points set out in Exhibit 6, marked "General information?"—Yes.

833. Why is it called an accident fund?—The original name was accident fund, because originally we only paid for accidents.

834. Since then the fund has been extended to cover sickness of all kinds?—Yes.

835. It is a co-operative undertaking between the men and the company?—Yes.

836. What amount is paid by each party to the fund?—One shilling per week per member by the men, and 9d. per week per member by the company.

837. Is it compulsory or voluntary?—Voluntary.

838. Is the control in the hands of the company or a committee?—It is vested in a committee of trustees appointed by the unions. There are eight union representatives among the trustees, and three from the company. The chairman is not elected by the trustees, but at an annual general meeting held in March each year.

839. How is the executive work of this fund carried out?—We meet once a fortnight, and the treasurer submits a statement showing the receipts and payments for the past fortnight. He also submits a sheet showing the number of claims received during the same period. These are submitted to the trustees, and gone through thoroughly. Usually most of the claims are passed, but in most cases it is found necessary to reject claims owing to men not being members of the fund.

840. You are the secretary?—Yes.

841. Is your time paid by the fund?—No. The company pay the whole of my salary.

842. That is, in addition to the 9d. per week, the company make a further contribution of your time?—Yes.

843. *By Mr. Robinette*—Your time is not wholly devoted to the fund?—No.

844. *By Mr. Gepp*—Such time as you devote is not charged against the fund?—No.

845. Are other incidentals, such as paper and telephones, paid for by the company?—Yes. They pay practically the whole of the running expenses. The fund pays for such minor items as stationery and stamps. That is about all.

846. How much is the amount paid in case of sickness other than plumbism?—It is 35s. a week.

847. Is there any difference between the payment to married and to single men?—No.

848. How much is paid in case of accident?—It is 15s. a week.

849. How many of the trustees are employees' representatives?—Eight.

850. When are these meetings held?—At 10 o'clock every second Monday morning.

851. Is that during working hours?—Yes.

852. If one of the trustees is working, either on day or shift work, is he allowed off by the company for the purpose of attending?—Yes.

853. Is he paid for that time?—Yes.

854. Does the company debit the amount back to the fund?—No.

855. Is he paid at the rate he would be getting at his job?—Yes.

856. That is another contribution the company make to the fund?—Yes.

857. How many members have you?—Approximately 1,160.

858. What is, therefore, your weekly income?—About £175.

859. Do you find the fund is generally appreciated by contributors?—Undoubtedly.

860. *By Mr. Robinette*—You are also secretary to the B.H.A.S. Co-operative Council?—Yes.

861. That body propose to institute a dental clinic?—Yes.

862. They are taking a ballot on it to-morrow?—Yes.

863. Who is to give out the ballot-papers?—The foremen or shift bosses.

864. What is the wording of the ballot-paper?—I cannot remember. It is really a question of agreement to the establishment of a dental clinic, and to contribute at a rate of 3d. a week.

865. If 50 per cent. of the employees signify their willingness to establish that fund it will be established?—Yes.

866. What will be the position of those men who do not signify their willingness?—They will not become members.

867. What will be the position of a new employee? Will it be a condition of employment that he must join the fund?—Yes.

The witness withdrew.

HENRY ST. JOHN SOMERSET, general superintendent, Broken Hill Associated Smelters, Port Pirie, was recalled and further examined:

868. *By Mr. Robinette*—In answer to question 135, you said the reported cases of lead poisoning are increasing at the moment. What did you mean by "at the moment"?—I was speaking at the time of the first 15 days of April. There was a reported average of almost two cases a day.

869. In question 140 you say, "If the cases are genuine I am at a loss to account for it." Do you doubt the doctor's certificate?—In some cases, yes.

870. In many cases?—In many cases I have not been satisfied that the cases reported were genuine lead poisoning cases; but I admit I am not qualified to criticise a doctor's certificate. That is my personal opinion.

871. Have you sent any men to other doctors?—Yes.

872. What has been the result?—In some cases the opinion of the local doctors have been confirmed, and in others they have not been.

873. Can you give the figures regarding cases referred to another doctor during the last 15 days or month?—Not from memory.

874. In question 147, comparing British with foreign workmen, you said they do similar types of work throughout the plant. Do not the foreigners do the more menial jobs where there is more hazard?—I should say the bulk of the foreigners are employed on the basic wage jobs.

875. Is not the hazard greater there?—I should not say so. Around the bottom of the blast furnace, for instance, a tapper is not on the basic wage, and he is just as exposed to fumes as any other man. A lot of basic wage men work outside in the open air all the time.

876. A good many cases have occurred recently among men working in the open air?—I cannot give figures on that. I do not think those figures are shown separately even in the table. It is difficult to say exactly where a service man will work from time to time. The bulk of his work is in the open air.

877. To a man cleaning up at the Dwight & Lloyd machines the hazard would be greater than to a man working on a machine?—It would be difficult to say.

878. The improvements you mentioned in question 162 were not carried out entirely to reduce the health hazard, but also to reduce costs?—They have not been made entirely to reduce the health hazard. Many were started with a view to improving the metallurgical work, but while that was being done we took the opportunity to improve the health hazard, even

though we had to make modifications for that specific purpose.

879. In question 421 you said that the authorities seem unanimous that alcohol taken in excess renders men more susceptible to plumbism than they otherwise would be. Do you consider a foreigner to be more temperate in the use of alcohol than the average Britisher?—I am absolutely unable to say.

880. Have you ever seen a foreigner drunk in this town?—I cannot say. I have seen very few people drunk here.

881. Do you not know foreigners are more temperate?—I do not know. I understand their drink is more usually wine than any other form of alcohol.

882. In question 427 you say that Dr. Robertson was disposed of on account of opposition from some of the unions?—Yes.

883. Did you consult the unions before employing Dr. Robertson?—No.

884. You issued peremptory notices demanding the men to submit themselves for examination?—I cannot remember that we issued notices. If we did so I can secure copies.

885. I am afraid your memory is defective?—It is very difficult to remember whether notices were issued, even if we did send them out.

886. You sent out a notice calling upon the men to submit themselves for examination and fixed the time?—In some cases. I think all those cases applied to members of the staff.

887. That is not so?—Practically all the men examined were members of the staff.

888. They would have lost their jobs if they had not been examined?—I will not discuss that point.

889. You did issue a notice calling upon the men to submit themselves for examination without consulting the men?—When you say "notice," I am not sure whether we issued a notice, or whether we advised the men to submit themselves to Dr. Robertson at different times.

890. Will you ascertain whether you sent out written notices?—If they were sent out by us and not by Dr. Robertson I think we could find them. If the notices were in the form of a circular we could certainly find them.

891. They were addressed to the men personally?—If sent out by the office, and you can give us the name of any one man, we can find them.

892. In your answer to question 433 you said you favored a periodical medical examination. Would you be prepared to compensate the man who was found to be unfit for work in the industry after having been declared fit on the initial examination?—No. That is not done, so far as I can ascertain, at any place except Broken Hill.

893. Would your company be prepared to compensate them?—No.

894. I take it your answer would apply also in regard to question 435, where you dealt with periodical examinations?—I think I should be allowed to explain my attitude. The answer is the same, because a man when he returns and applies for work at that time is certified by a doctor as healthy and fit to work, and there are other avenues of employment in the town besides the smelters. We have known of cases where men left the smelters on plumbism certificates and went to work practically immediately in other works in the town, even though they had certificates declaring them unfit to work anywhere. Those are much worse cases than those of the men who come with certificates showing they are healthy, and I submit those men have other avenues of employment in and around Port Pirie, and consequently should not be compensated for loss of employment, when such probably would not exist.

895. In those cases you mention of men having been compensated, did not the doctors' certificates say that they were incapacitated from earning the full wages they were getting previously?—Yes.

896. The doctors' certificates did not say that the men were totally incapacitated for earning money?—I should like to look at the exact wording. They say the men are totally incapacitated, but there is some qualification.

897. In reply to question 449, you said that the law operated onesidedly, laying certain penalties and liabilities on the employer, whereas it did not compel the employee to observe any rules that may be made to safeguard his own health. Has your company ever been penalised for a breach of the rules?—I say that the law lays penalties and liabilities on the employer. Our penalty is that if a man contracts lead poisoning on our works we have to pay him compensation.

898. You were speaking of the penal clauses when previously giving evidence?—We have not been penalised in that way.

899. Has there been any variation in the class of ores used in smelting during the last two or three years?—I do not know that that is so in the last two or three years, but there has been in the last four or five years.

900. Just prior to the shut-down what was the percentage of heavy concentrates to slimes you were using?—From memory I should say that of all concentrate forwardings 66 per cent. would be granular concentrates. That is purely an estimate.

901. What is the percentage now?—The percentage we are at present treating is somewhat less than that of granular concentrates and more of slime concentrates. It varies according to the forwardings from Broken Hill. The current forwardings from Broken Hill are about 70 per cent. of granular concentrates and 30 per cent. of slime concentrates, but our reserve stocks at Port Pirie are mainly slime concentrates, and we are treating these slime concentrates in greater proportion than the percentage on the current despatches from Broken Hill. We are at times treating on the charge about 66 per cent. of slime concentrates and 33 per cent. of granular concentrates. There are more slimes than granular on some days, and *vice versa* on other days.

902. What percentage of Tasmanian residues are you using?—About 600 tons a week, which on the concentrates would be about 14 per cent. of the concentrate weight.

903. Do you think the increase in the percentage of slimes is one of the causes of the increase in lead poisoning?—I do not think so, because although the slimes material is finer and more dusty than the granular concentrate if allowed to dry, it is wetted up to the time it enters the Dwight & Lloyd machine, and the final Dwight & Lloyd product we now make is very much freer of unroasted fines than it used to be. Therefore there should be less dust from the Dwight & Lloyd material after it is sintered than there used to be, although the initial material is certainly finer.

904. *By Mr. Gepp*—Referring to construction you mentioned, in reply to Mr. Robinette, that new construction was undertaken not only in respect of the health hazard, but also in regard to metallurgical improvement?—Yes.

905. Is it not so that in all cases new construction is never undertaken unless it definitely and specifically reduces the health hazard as compared with the previous plant?—That is absolutely so.

906. In regard to Dr. Robertson, you told Mr. Robinette that there was no consultation with the men prior to his appointment. Was there any consultation after that date?—Yes; there were a number of meetings with the unions.

907. Can you tell us how those consultations occurred and for what general reasons they did occur?—They were held at the request of the unions, who wished to put their views regarding the appointment of the doctor before us, and to give us an opportunity of putting our views regarding Dr. Robertson's appointment before them. Some of the meetings lasted a long time—until 2 or 3 o'clock in the morning on some occasions. Finally the unions definitely and absolutely refused to work on the smelters if the men were to be examined medically by Dr. Robertson. In those circumstances we could see no use in continuing Dr. Robertson's appointment, and we terminated our engagement with him.

908. You have previously said that your feeling in this matter

was that the men feared that the information which it would be necessary for you to obtain from the doctor would be used unfairly against their interests?—That was the union's argument.

909. You have said previously that you felt that was incorrect, and that the information would not be used except from the point of view of the best interests of the men and the industry?—I know that on my part it would have led to no injustice whatever in any case.

910. An exceedingly important question before the Commission is that of medical supervision, which is universal in lead industries in all the large manufacturing countries of the world. I am sure the Commission would be glad if you could submit to them any thoughts or suggestions in regard to the way in which a medical man, if appointed, could carry out his work to remove any such suspicions as might be engendered. Would you be prepared at a later date to submit your thoughts in writing to the Commission for consideration?—I would be glad to do so.

911. In regard to the question raised by Mr. Robinette concerning workmen's compensation, that is, compensation for a man who might be declared not suitable for the industry, after a certain amount of employment, is there not a difference between a skilled worker, such as a miner at Broken Hill, and a workman at Port Pirie who in quite a number of cases would be classed as a laborer?—Yes; there is a difference. In the first instance, the ordinary labor is not skilled any more than any other ordinary labor. In the second place, it has not been uncommon for us to take on a man from the gate and put him on as a furnaceman, which is a higher rate than the basic wage, when he had never worked in such a position before. He was doing furnaceman's work, but could not in my opinion be called a skilled man in any sense of the word. We have a number of cases of that sort throughout the works.

912. *By Mr. Pearson*—In your reply to the questions respecting the lead contents of the different proportions of the charges, you gave certain figures. Is the average lead content of the full charge higher or lower than it was, say, two years ago?—It is almost exactly the same as two years ago. It is lower than it was in 1917, but it has remained around 44 per cent. for five or six years.

913. With regard to the zinc concentrates, the material being roasted for sulphuric acid making, you gave the lead content as approximately 6 per cent. Do you regard that as lead material from the standpoint of health hazard?—It is higher than the limit set by the authorities. Their limit is 5 per cent.

914. Would you accept the English authorities as a standard?—I do not know that I am competent to judge, but we have been accepting it in that light.

915. Have you any information as to the composition of the fumes liberated at various stages in the roasting, smelting, and refining operations, in connection with the lead ores?—No exact information. It is natural that all fumes coming from the roasting and smelting operations contain oxides of sulphur, also some lead and zinc.

916. In the form of oxides?—The lead as basic sulphate in most cases, and the zinc in most cases oxide.

917. Has there been any systematic dust survey made of any section of the company's works?—We are making dust surveys at present. We have made a general preliminary survey of certain parts of the works, but I need hardly explain that in order to get the average of any particular part the work would have to be done again and again in different winds and different weathers, and so on, before you could say your result was indicative of the average condition at that place. In one place to-day we might get one figure and to-morrow it would be entirely different if the wind changed, or if the weather conditions were heavy or light, and so on.

918. The work is going on, but you have no results which might be regarded as authoritative?—None that I could put before the Commission. They might mislead the Commission either way.

919. In regard to the change-house, we noted during the inspection that there were no heating appliances. I understand that the men using the change-house had complained of the extreme cold under winter conditions. Would the company be prepared to make some provision for warming it?—We would be prepared to do anything the Commission considers desirable.

920. In connection with the question of medical examination, I understand that all new employees taken from the gate have to possess a medical certificate. How are these certificates obtained?—A man before being registered at the gate for work, that is, before being eligible for employment on the smelters, must go to a doctor and get a certificate showing that he is free from plumbism or industrial disease, and is otherwise physically fit for work on the smelters.

921. A certificate would be accepted from any duly registered medical practitioner in South Australia?—Yes; and we have accepted certificates from Melbourne doctors given before men have been sent over here.

922. As to the fee charged for examination; does the applicant for work settle personally with the doctor?—Yes.

923. In your replies to questions 786 to 792, you quoted portions of the regulations relating to lead poisoning in various countries, and advocated their adoption in South Australia. The portions of the regulations to which you drew attention apply only to employees in the industry. In most of the countries where these regulations are in force there are also detailed regulations affecting the works, while in South Australia there are only general regulations which apply to all works?—That is so.

924. From the general standpoint, do you think it is advisable that detailed regulations should be adopted for both sides?—Personally, I would have no objection at all to that. It is only right that if one side is bound to comply with certain rules, the other side ought to be bound. I naturally anticipated that that would come were any regulations made covering the industry.

925. In connection with some works I notice there are regulations which are particularly stringent against dust accumulation in buildings or in connection with the framework of buildings. They provide for no sills being left and for details of a similar character. I take it that in the interests of health you think that would be desirable as well as practicable?—In the lead smelters which I saw while abroad, in no case was that given any greater attention than is done at Port Pirie. It is a matter which would naturally have to be attended to when a building was being constructed originally.

926. In one of the Continental regulations, German or Austrian, they provide for established buildings being modified to meet these conditions within a certain time after the regulations coming into force?—I do not know. I was not in either Germany or Austria. It would be a very big job indeed to alter the present smelter buildings in such a way that no beams were left on which dust could settle. It would be practically impossible without completely rebuilding.

927. In your reply to question 24, you gave a list of smelters which you visited in various American States. Could you give us any idea of the extent of plumbism amongst the employees on those works?—No. The only information I got was general. In all instances it was to the effect that there was very little plumbism. When I asked what that meant the reply was, "Two or three cases a year." I saw no figures of any sort.

928. A report of the United States Bureau of Labor, describing the conditions in 1912, states that the total number of employees was 7,500, and an investigation had shown that 1,769, or approximately 23 per cent., were affected by plumbism?—I knew of that figure, but that is 12 years ago. What the condition of the American lead smelters was like in those days I do not know. I had not seen them before 1924. Maybe the condition is very much better. From what these men told me it must be so.

929. Do you know how the lead content at American smelters would compare with ores being treated at Port Pirie?—In a number of them the ore is practically identical with ours as

regards lead content, but it contains less zinc as a rule. Physically, at most of the smelters it is the same as ours, in that there are granulated concentrates and slime concentrates—they call them flotation concentrates—treated at the smelters. The processes are generally the same as ours. That is to say, there is pre-roasting done, either in Dwight & Lloyd machines or in Wedge furnaces, and a finishing roast either on a second section of Dwight & Lloyd machines or in Huntington-Heberlein pots. There are some smelters in America, however, that smelt with a considerably lower percentage of lead on the charge than we do. Usually their percentage is around 40 per cent. of lead in the sinter, but in some smelters it goes very much lower than that—around 20 per cent. I visited mainly the big smelters, where it is mostly around 40 per cent. Obviously the endeavor is to keep the lead as high as possible in charge roasted and smelted, so that the cost per ton of lead will be lower. If you had a given quantity of lead in two tons of charge the cost would be lower than if you had that tonnage distributed over five tons.

930. You mentioned the Herculaneum smelter, and the fact that they had medical supervision with a view to reducing the hazard in connection with lead poisoning and other industrial diseases. There or elsewhere did you notice any other special precautions taken against plumbism?—Nothing except the change-houses. At the Herculaneum smelter no man was employed on the works unless he passed every day through the change-house. That is a comparatively small smelter, and every man I saw there was wearing a sort of blue overall. They had two change houses—one for black and one for white men. They were equipped with hot and cold water, shower baths, and basins, just as ours are, but the clothes were drawn up on wires to the roof, as is usual in many mine houses I have seen.

931. *By the Chairman*—Did you have an opportunity in America to observe the nationalities of employees in smelters?—Yes. I took particular notice of the men, largely to see whether they looked healthier than our men, and in doing so could not help noticing that there was a lot of foreign-looking men working on most of the smelters. Getting down towards St. Louis and Omaha the percentage of negro workmen increased immensely, until on some smelters they preponderated largely over white workmen.

932. Were the negroes of good physique,—Yes.

933. You say there were few reported cases of lead poisoning. You did not have an opportunity of determining whether there was any question of increased susceptibility in the case of negroes?—I particularly asked that question at the Federal lead smelters, where there were a great number of negroes compared with white men. The superintendent told me there was very little plumbism, and it did not exist any more among the negroes than among white men.

934. Are you of opinion that at any particular point in the process in the Port Pirie smelters a dangerous amount of carbon monoxide is liberated?—There is only one point where it might be possible. The gas that passes through the baghouse contains small quantities of it. The blast furnace process is one in which the atmosphere of the furnace must be kept on the reducing side, otherwise it is impossible to get the lead out of the sinter, so that the gases that issue from the top of the blast furnace contain small amounts of carbon monoxide. The tops of the furnaces are open, and air is drawn in there. If you eliminate that diluent the percentage of carbon monoxide taken out over the surface of the charge would be around 2½ per cent. to 3 per cent.

935. That air is not breathed?—No. It is taken in under the hood erected over the blast furnace.

936. Do you consider that there is a possibility of chronic poisoning by carbon monoxide occurring in the smelters?—It would be difficult to say. I do not know sufficient about the subject, or what quantities of carbon monoxide are necessary in the air to bring it about. The only place where I would consider it possible is in the case of effluent from the baghouse being continually breathed. That might do it. I do not know.

No. 57.

Mr. Gepp (to the Chairman): This point has had the attention of the smelters, and apparatus is being brought down from Broken Hill now to make a number of determinations to check the position. The estimation of very minute quantities of carbon monoxide is tricky, has to be done by an expert, and is a slow job.

937. *By the Chairman*—Has the company at any time during the history of the smelters dealt with ores containing appreciable quantities of manganese?—In its very early days there was appreciable manganese in the ore. At present our slags assay about from 5 to 6 per cent. of oxide of manganese.

938. Where does that come in?—From the gangue in the Broken Hill concentrates. There is one specific mineral in the Broken Hill lode from which the manganese comes.

939. *By Mr. Robinette*—When you were in Burmah were the doctors there employed exclusively on mine work, or on work in the town also?—They were employed for the whole of the people there, because the mine is the only industry of any kind at Namtu.

940. What is the population?—Including itinerant Chinamen, etc., about 20,000.

941. *By the Chairman*—Were there native doctors there?—I do not know. I did not go into the native settlement.

942. *By Mr. Pearson*—In the regulations detailed by Stone, where medical examination is mentioned, the medical practitioner is usually referred to as the certifying or reference surgeon. It is not clear who has the appointment of that surgeon. Have you that information?—No.

943. The American Bureau of Mines have a recent publication advocating the diluting of fumes before distributing them by forcing air in with fans. Did you see that method in use in any foreign plants?—Yes. In some of those plants where the fume was sent direct to atmosphere without previous treatment, they were using diluent fans at the foot of the stacks. That was so at the Murray and the Midvale smelters.

944. Did that made conditions better?—It was not done for that purpose, they told me. They said the sulphur fumes were acting on the vegetation around the place. It was to dilute the air to such a point that the sulphur dioxide did not affect the vegetation that they did this. At Murray particularly I was told that the trouble before they had the diluting fan was due to the stack being very low. At the same time that they diluted the air they put up a very much higher stack. A higher stack, but not a diluting fan, was put up at the Federal Smelter in Illinois also, and overcame the trouble completely.

945. In regard to Mr. Pearson's question respecting the construction of buildings, a number of the buildings you referred to are of considerable age?—Yes. Some are over 20 years old.

946. Do they go back almost to the foundation of the company in 1897 or 1900?—They must go back to nearly that time, but I do not know to what extent they have been added to.

947. The Commission cannot hope to deal in detail with the whole of the smelting operations, but it can be expected to cover in general principles a number of suggestions and recommendations after discussion with you and your experts, and may be able to make certain recommendations, such as the improvement of buildings by the reduction of areas for settlement of dust, &c. I presume all such things as are within the realms of practicability would be heartily welcomed and undertaken by the company?—That is so.

The witness withdrew.

GEORGE DEY, industrial officer for hygiene, Broken Hill Associated Smelters, Port Pirie, was recalled and further examined:

948. *By Mr. Gepp*—What is the body known as the Broken Hill Associated Co-operative Council?—It is a body representative of both the company and employees throughout the whole of the plant.

949. How is it constituted?—The employees' representatives are elected by ballot and the company's representatives are nominated by the company.