WEST AUSTRALIAN BLUE ASBESTOS FIBRE COMPANY

This report is written in response to wired instructions of September 21st, as the result of which I travelled by car to Mullewa and joined the north bound plane on the morning of the 27th. Mr. Blockley of the Treasury met me at the plane according to arrangement, and supplied what explanations were necessary but could not have been conveyed by your wire. He has also made available for my assistance Mines Department file No. 352/45 covering the matter of the Government's guarantee of a bank overdraft of £25,000 on behalf of the West Australian Blue Asbestos Fibre Company. Our joint mission is to report on the past, present and future operations of the Company from our own particular aspect, for which purpose we have made a mutual exchange of information. The ensuing remarks are made from the point of view of a mine operator and any figures supplied by Mr. Blockley and here quoted will be specifically acknowledged at the time. Other figures dealing with various costs will be used, and it is to be understood that these are close approximations only, and are used mainly for comparative purposes.

Before continuing with the report, a brief outline of developments over the past 6½ years may help to dispel any confusion which could arise in the mind of anyone not familiar with the asbestos industry in this State, due to the similarity in names of the two major operating Companies.

In the early part of 1939, Mr. I. Walters operated a small plant in Yampire Gorge on behalf of an English Company - Asbestos, Molybdenum and Tungsten Ltd. The fibre production was spasmodic and was shipped from Roebourne to Singapore, and thence transhipped to London. After several periods of idleness, apparently caused by the war, De Bernales interests bought the undertaking, and the operating Company is now known as West Australian Blue Asbestos Fibres Ltd., which is controlled through Australian Mines Management and Secretariat Ltd., and is now under the direct management of Mr. S. H. Stubbs. The same interests also are holding leases at Marra Mamba, about 50 miles to the West, and at Marillana, some 50 miles to the East of the Yampire Gorge Leases. (These latter two holdings are not being actively worked.)

At about the time that Walters was in operation, L. G. Hancock, of Mulga Downs Station, held leases in Wittenoom's Gorge some 15 miles West of Yampire Gorge, and erected on them a small home-made plant which gave surprisingly good results. He finally succeeded in attracting the interest of Colonial Sugar Refinery, who now hold the controlling interest in Hancock's leases, and operate them under the title of Australian Blue Asbestos Ltd. with Mr. Hancock as Superintendent.

After selling out in Yampire Gorge, Walters moved to Wittenoom's Gorge and pegged some leases adjoining Hancocks, but these were also acquired by West Australian Blue Asbestos Fibres Ltd. and are now being worked in a small way. The fibre from them is carted 35 miles and milled in the Yampire Gorge plant.

Geological Survey Bulletin No. 100 should be read in conjunction with this report.

The Government is asked for further assistance by the Company, to establish the asbestos industry, and before this can be considered, the security for the previous guarantee must be examined, and this will be attempted immediately. Mr. Blockley has given me a copy of an "Inventory of Machinery, Plant and Buildings at Yampire Gorge 1st August, 1945" which has apparently been produced by the Company in support of the application for increased assistance

A similar inventory was prepared at the time of the original request for the guarantee of the bank overdraft of £25,000 and it covers the same items, though the later inventory includes material brought to the leases since the earlier one was made up. A comparison of the two lists produces results which would seem to be a trifle irregular. On one occasion, a price shown for an article on the later list, is more than doubled on the earlier list. In very few cases do the figures agree, and there is no systematic disagreement which could be accounted for by a depreciation factor or similar allowance. In fact for some articles the price on the later list is often much higher than on the earlier. Some items have been shown twice, others which are on the ground, are not shown at all, while yet others which are shown on the list have not yet arrived. Mr. Stubbs informs me that the items were listed at the mine for the most part, but the prices were added in Perth. Mr. Blockley will cover this aspect in greater detail and in the meantime it has been decided that I attempt to assess the break-up value of the plant. In view of the lax methods of compiling the inventory, this assessment will have to be based largely on my own experience, and the items on the list as supplied will have to be dealt with more or less individually.

The valuation of a mine plant is always a difficult process, but a few obvious principles can be used as a guide. Firstly, even a poor plant may have a high value if it can be kept operating on a good mine, while the same plant can be almost valueless if the pay ore in the mine cuts out. This means in simple terms that there is a great deal of difference between the operating value and break-up value of any plant, and the difference varies according to the condition of the machinery. Isolation postulates a big decrease in the resale value and is particularly applicable in the present case. If the present plant were put up for sale, Australian Blue Asbestos, the Colonial Sugar Refinery Company's undertaking in Wittenoom's Gorge, is the only prospective buyer in a position to offer reasonable prices for any item that they require, for the reason that they would need to freight it only 35 miles. Outside buyers would probably have to pay freight on their purchases up to 1,000 miles or more, and consequently would be offering very low prices. Some units always have a comparatively high re-sale value, while for others it is often impossible to get a buyer. For instance Diesel power units and electrical equipment come into the former class, while outmoded machinery, and the etceteras such as special chutes, covers, etc., which are part of every plant and which cost a lot to erect, fall into the latter class.

In particular the treatment plant would have a low resale value for a variety of reasons. Firstly, a large part of it could only be used in another asbestos plant, and C.S.R. is the only other operator in the business at the moment. Their plant is far superior to this one and they would not be offering high prices for poor equipment. Secondly, the machines have suffered a great deal of wear owing to the hardness of the gangue material, and bearings are probably badly worn through operating in a dusty atmosphere. These conditions have been aggravated by the facts that the milling is done on contract, and that pressure for production has cut maintenance to the dead minimum. The contractors are always in a hurry to get the plant in operation so that even lubrication is neglected.

The cessation of hostilities will have an effect on resale values, since buyers are likely to postpone purchasing as far as possible in the hope that new machinery will be shortly forthcoming, and that items such as sales tax will be reduced. Apart from C.S.R., the only other prospective buyers able to offer reasonable prices would be Blue Spec Gold Mines and Comet Gold

ines, and it is certain that a representative of the latter company would be at the sale.

Most people who are interested in the purchase of mining machinery are well aware that De Bernales' undertakings are usually equipped by shuffling from one mine to another, second hand machinery, which in some instances is only fit for the scrap heap. Keen bidding is not to be expected from these buyers for machinery of doubtful condition and age, as is a fair proportion of the present plant.

The above facts must be borne in mind when reading through the prices which I have put on the various items, and which show some very severe reductions on those supplied by the Company. As a general guide you could refer to the prices for the Wodgina break up, which I understand has taken place, or is about to take place, but account must be taken of the fact that the Wodgina plant was a much better one than this one, and did little work after its erection.

It is difficult to see how the Company arrived at the prices shown on the inventory, but they seem, with few exceptions, to be new prices at Perth, with a sum of £28,000 added to allow for freight and erection costs. The prices that I have shown are estimates of what would be got for the material as it stands on the lease, since if it came to the point of disposal, I assume that this would be done by auction or tender, as is being done all over the country at present with surplus war time undertakings.

Here then, is an estimate, with comments, based on the inventory of August, 1st. The left hand column of figures shows my appraisals, while the right hand column is taken from the inventory.

ENGINES.

(1).	2..5 h.p. National Kero Engines. One drives starting air compressor and the other drives concrete mixer and they would be sold with them. Price shown is about new pre-war. Petrol and kerosene engines have low resale value. Value of one engine included in item 12 hereunder. The second engine is a duplication and appears in Sundries item 6.	-	150
(2).	3..8 h.p. National Diesel Engines. One is duplicated and is (valued) in item 5. The other two are not in use. One has a cracked head. Both second hand. Price shown is about pre-war new. Two only.	150	390
(3).	1..38 h.p. Lister Engine and Compressor (Portable). In fair order. Used as auxiliary at Yampire Gorge. Shown at about pre-war new price. Portables have comparatively high maintenance cost and only fair resale value.	400	1100
	(Total Carried Forward.)	550	1640

		(Brought Forward)	550	1640
(4)	1	40 h.p. Dorman Ricardo Portable Compressor unit. At Walters leases. (Price shown is pre-war new.)	400	1100
(5)	1	9 h.p. National Diesel direct-coupled to 5 K.W. DC generator. See item 2 above. (Could not have cost price shown even when new. Had done a lot of work. Fair resale value.)	100	450
(6)	1	5 cylinder F.A. National Diesel (275 h.p.) driving 100 K.W. 44 V. alternator. (Engine is second hand and needs maintenance. Gudgeon pins are worn. The alternator is a converted generator and is old. Vee belt drive. Fair resale value.)	2000	3500
(7)	1	N.A.W. 1 cylinder National Diesel driving 50 KVA 440 V. 50 cycle alternator. (Shown at about pre-war new price. In fair order and has fair resale value.)	500	1200
(8)	1	6 cylinder Crossley Diesel Engine 100 h.p. A reconditioned transport bus engine taken over with Walters' leases. (Atomisers are worn out and no replacements are available. New price shown.)	400	1200
(9)	1	142 h.p. Vickers Petters Diesel Engine. A 2 cycle engine of old design, and has not yet been erected. (Bought to drive Bowett and Lindley Compressor. Fair resale value.)	500	1400
(10)	1	Alternator with Switchboard and instruments 250 K.W. 440 V. 50 cycle. Duplicated on last page of inventory. (Is an old model and shown at about pre-war new price. Fair resale value.	500	1700
(11)	1	220 c. ft. Compressor Broome & Wade. (In fair order and has fair resale value. Shown at about pre-war new price.	150	400
(12)	1	National Compressor Kerosene Engine and receiver for starting engines. Engine from item (1) above. (All prices shown are about pre-war new. All in fair order and would have fair resale value.)	70	160
(13)	1	Large air receiver 16'6" x 6'6". This is an old boiler brought from Whim Creek and is therefore probably about 30 years old, and has no pressure Ticket. (Very low resale value.)	20	200
		(Total Carried Forward)	5190	12950

		(Brought Forward)	5190	12950
(14)	1	Small air receiver 7' x 4'. Actually 7' x 3'. Is in good order and has guage and inspection cover. (Fair resale value.)	30	75
(15)	1	500 c. ft. Air Compressor Browett and Lindley, 2 stage. Not erected. Second hand but appears in good order. (Shown at price which seems above pre-war new for such a small capacity. Fair resale value.	500	1500
(16)	1	220 c. ft. Holman Compressor. Bought with Walters' Leases. (Shown at pre-war new price. Fair order. Fair resale.)	150	500
(17)	2	Air Receivers 15' x 5'. Apparently conversion. (Very low resale value.)	30	300
(18)	1	Tractor Bulldozer 6 cylinder Cletrac B.D.H. Diesel. Tractor is second hand and gets rough treatment so is often under repair. Blade and hydrolic control equipment manufactured on the job. (Shown at pre-war new price. Fair resale value.	600	1200
(19)	1	Loader - Gardner Denver. Brand new. (New price.)	1250	1250
(20)	1	Friction winch. Good order grooved type. (Low resale value.)	20	60
(21)	1	Electric Winch double drum with 15 h.p. motor and controls. Small type. Good order. (Shown at very high price. Fair resale.)	200	600
		(Total for Engines.)	7970	18435

MOTORS.

A.C. 440 Volt 50 cycle.
(As far as I can determine the motors are shown at about pre-war new price.) The 15½ horse power motor shown on the list is a duplication and is included in the 3 15 horse power motors constituting the third item. (In general, motors have a good resale value since they have few moving parts and electrical coils do not wear out if properly treated. However, the very fine dust from the mill in which the bulk of the motors is used has got well into the windings and bearings so that their new value must be heavily discounted for a break-up assessment in an isolated area in which there are few electrical installations of any kind.) 1000 2300

MOTOR VEHICLES.

1 Dodge truck has no tyres, and the springs have been taken out and used on bulldozer. It is practically wrecked. The second truck continually breaks down. The runabout misfires and the track rod keeps falling off. The body work on all vehicles is dilapidated beyond repair at reasonable cost, and they are all continually causing hold ups, despite a lot of half-hearted tinkering. They are a liability rather than an asset on an undertaking of this nature. The tyres are in only fair condition on the two vehicles that have them, and at present the second hand value of vehicles in bad mechanical condition is largely a function of the value of the tyres.	100	600
Total for electric Motors and Motor Vehicles	1100	2900

TOOL SHARPENING.

(1)	1	Climax Tool sharpening furnace. Shown at new price and is in good order. It has no moving parts, but is subject to heating so that linings have to be replaced. Good resale value.	40	75
(2)	1	Holman No. 11 Tool sharpener. A fairly old machine which has done a lot of work and often gives trouble. Low resale value.	150	475
(3)	1	Climax tool sharpener, with spares. A small machine, but is nearly new and gives no trouble. Good resale value.	250	475
		Total for Tool-Sharpening.	440	1025

ROCK DRILLS.

Second hand rock drills are always a very doubtful proposition from the buyers point of view. Although they are of very rugged construction, they receive, almost without exception, continued abuse from the miners. They are made of special alloy steels, and their inner surfaces are accurately machined and case hardened, as are all moving parts which means that their first cost is high. Even without abuse they are subjected to considerable wear since they are high speed machines and their resale at a reasonable figure depends almost entirely on whether spare parts can be bought with them at the time. There are some spare parts in the store for all drills, and if they are sold with the machines, a fair price would be got for the latter. More spare parts are expected from Yinnietharra.

(1)	3	28 Holman Rock drills. Nearly new. Two at Yampire and one at Walters'. With spares.	180	300
(2)	1	Large Ingersol Rand Rock drill. Spare machine in tool shop with spares.	60	100
(3)	3	240 Holman Rock drills. Two nearly new and one fairly old at Walters'. With spares.	200	300
(4)	7	Silver Bullet Holman rock drills. One bought with Walters and six from Yinnietharra. With spares.	280	500
(5)	4	Thor Hand drills, not two as stated. Two new, and two idle for lack of parts.	60	100
(6)	1	C.P. 3" Rock drill. Good order. Only few spares available.		
	3	Climax rock drills. Use $\frac{7}{8}$" hexagonal steel, none of which is at present available on the mine so drills not in use. With spares.	120	320
		(Total for Rock Drills with parts.)	900	1620

SUNDRY.

(1)	1	Lathe.		
	1	Radial Drill.		
	3	Blacksmith's Anvils and blocks, etc. The lathe is very old and has a bent spindle and broken teeth in the spur wheels. The drill is old but seems sound. There are three anvils altogether and a quantity of the usual blacksmith's tools. (All of this equipment has a very low resale value in this area.)	150	450
(2)	1	Refrigerating Plant complete with freezing room. This plant is about 12 months old and is in good order. (Apparently new price is shown. Good resale value.	750	1325
(3)	15	Mine Trucks. Thirteen at Yampire and two at Walters'. Some from Whim Creek. (Low resale value.)	45	150
(4)	1	Concrete Mixer complete with engine. Medium size outfit with 5 h.p. National kerosene engine. See item (1) under Engines. Partially dismantled. (Price shown apparently new. Fair resale value.)	100	350
		(Total carried forward.)	1045	2275

		(Brought Forward)	1045	2275
(5)	1 1 1	2 ton chain block 3 ton chain block 5 ton chain block. Not 3 ton as stated. In good order. (Good resale value.)	20	35
(6)	1	Refrigerating plant complete with 3 h.p. Southern Cross Engine. (This was bought in Roebourne together with the large store of the Northern Trading Co. for £1,000. It is said to be in good order though it is not erected. Over valued at £600. Fair resale value.)	200	600
(7)	1	Fuel tank and stand. Capacity 30,000 gallons. At Point Sampson waiting to be erected there. (I did not see it, but it is said to be new.)	-	2000
(8)	2	500 ft. double flying foxes. Abandoned in favour of rails and skip. (Low resale value.)	100	400
(9)	4	Spare sets conveyor head and tail pulleys complete with adjusting blocks and idlers. There are six sets on job, four are new and two second hand. (Low resale value. The four new sets could not possibly have cost £500 per set.)	300	2000
(10)	3	Jaw Crackers 15" x 9" each. One is duplicated in item (16). It is in fair order and is on Walters' leases. The other two are at Yampire Gorge and one is in pieces. (They have a low resale value.)	150	1050
(11)	1	Sturtevant 16 x 8 Jaw Cracker. Duplicated in item (10) above.	-	400
(12)	1	Type Ty. Traylor Crusher 1' 8" with spares. Brought in second hand. The most trouble-free unit in the mill. (In fair order and would have fair resale value.)	300	650
(13)	1	Large Sturtevant Rolls with spares. These are 30' x 15' and were part of the old Whim Creek plant which was purchased by Walters, who sold items to both this mine and C.S.R. The rolls are not less than 30 years old and C.S.R. got a duplicate set for £150. (The price shown here is roughly pre-war new price for a modern set of rolls of the same size. Very low resale value.	50	600
(14)	1	Small set of Sturtevant rolls. Not in use. (Too small. New price shown. Very low resale value.)	20	250
		(Total carried forward.)	2185	10260

		(Brought Forward)	2185	10260
(15)	1	Set 20" x 12" Jaques rolls with spares. These rolls have been woefully ill-treated. One roll had cut right through its brass on one side, and into the iron frame, yet it was still being used though the electric motor driving it was running so hot that an air jet was played on it in the last stages. This set is of modern design but as rolls are little used these days it has a low resale value.	50	600
(16)	2	Sets Allan rolls with spares. These are 20" x 12" and are worn. (They were here 6½ years ago to my knowledge and are not now in use having been thrown out on the dump. Very low resale value.)	50	500
(17)	1	Rotex Screen with Spares. There are two of these in the mill and they were imported from England. (C.S.R. had two made under license in Melbourne and the agreed price was £950. Fair resale value.)	300	150
(18)	3	Niagara Screens with spares. Two are in use in the mill and one is on the dump but will be brought in soon. (Fair resale value.)	250	750
(19)	2	Shaker screens with spares. New from Kalgoorlie foundry. Not yet used. (Fair resale value.)	300	500
(20)	1	Jaques vibrator screen with spares. (Shown at new price. In fair order.) Fair resale value.	100	300
(21)	1	Trommel Screen, with spares. (Has not been properly lubricated. In fair order and has fair resale value.)	50	150
(22)	5	Large cyclones with connections. One came from England and four were made on the job of heavy galvanised iron riveted and soldered. (Very low resale value.)	50	600
(23)	1	Kubit Hammer Mill with spares. Of English make. (Subjected to more normal wear than any other machine in plant so has low resale value.)	200	1325
(24)	4	Large exhaust fans. There are 5 altogether; 2 are nearly new, one is fairly old and two were made on the job. (Fair resale value.)	100	250
(25)	1	5' 6" displacement fan. Not being used. Consists of a 6 bladed propeller and plate baffle only. (Low resale value.)	30	100
		(Total Carried Forward.)	3665	15485

125

		(Brought Forward.)	3665	15485
(26)	4	Small exhaust fans. Only one in use. (All in fair order only. Fair resale value.)	30	100
(27)	9	Conveyors complete with head and tail pulleys, driving reductions etc. with gantries. Four are about 20 ft. long, four are about 40 ft. and one of 70 ft. This means about 650 feet of belt. (It is hard to see how they could have cost £2,700. Low resale value.)	500	2700
(28)	1	Picking table complete with drive and eccentric. Not yet erected. (Good order but low resale value. Made on the job.)	50	150
(29)	1	Large Crusher 30 x 12 Jaw. Only the flywheels with shafting and swing jaw have arrived on job. Main frame is in Roebourne. (Fair resale value.)	300	800
(30)	1	Traylor Crusher remetalling jig. This item consists of two small castings, one of which fits inside the other and both can be carried about. (It has not been used and the invoice price is £14., yet it is shown here at £650. It is quite worthless to anybody but the purchaser of the Traylor cracker and would have to be thrown in with it.)	-	600
(31)	1	Electric 300 Amp. Welder. (Nearly new and good resale value.)	50	100
(32)	1	Road Grader with 6 ft. blade. Consists of hand controls for the blade, mounted on a small camel back chassis running on four iron wheels so that it has no rubber tyres. It has no engine and was designed to be towed by a truck or tractor. (It could not have cost £750. new if it had been gold plated. Low resale value.)	50	750
(33)	1	5 ton weighbridge. Came from Whim Creek and is therefore about 30 years old. Not in use. (Low resale value.)	20	150
(34)	6	Wheelbarrows. (No resale value.)	-	-
(35)	1	Corrugated Iron Curver. Fair order. Came from Whim Creek. (Fair resale value.)	20	75
(36)	4	tons of drill steel. All in use. (Very low resale value.)	40	400
		(Total carried forward.)	4725	19260

		(Brought Forward)	4725	19260
(37)	1000 feet 20 lb. rail. 9½ tons tram rails 5000 feet piping. The first lot of tram rails is in use. The second lot was bought at Yinnietharra and has not yet arrived, while the piping is all in use. (Low resale value for rails but higher for the pipes.)		150	250
		(Total for Sundries.)	4875	19510

BUILDINGS.

The buildings are for the most part of wood and iron, with the exception of the power house and mill buildings which have steel frames. Much of the timber is new, but the bulk of the iron is second-hand. The miners huts are entirely new, but the remaining small buildings were apparently made up out of a number of second-hand buildings purchased in Roebourne. A large store was bought, together with some smaller structures, and a disused hotel from Cossack, and all were dismantled and re-assembled in different forms here. The resale value of this material is only fair. Only walls and roofs could be resold because floors when present are of cement.

(1)	1	Power House. From Southern Cross United Mines. Steel frame only. Partly covered by iron. (Fair resale value.)	500
(2)	1	Building housing treatment plant. Frame of steel with some wood. Is roofed but has no sides. (Low resale value.)	100
(3)	1	Building housing blacksmith and tool sharpening shop. Bush shed consisting of roof only supported on various odds and ends. All second-hand. (Almost no resale value.)	5
(4)	1	Building containing three offices, store and two bulk stores. Iron and wood frame. Both second hand. New asbestos lining in offices only. (Fair resale value.)	200
(5)	1	Mess room, kitchen, stoves, store rooms and equipment. New timber, old iron, no lining. (Fair resale value.)	150
(6)	1	Change room with showers, basins, troughs and installations. New timber, old iron, no lining. (Low resale value.)	100
(7)	1	Iron building used as temporary Mine Store. Bush timber frome. Some new iron and some old. (Low resale value.)	10
		(Total carried forward.)	1065

		(Brought Forward.)	1065	
(8)	12	Miners Huts, iron and asbestos. Not iron as stated, but all asbestos and all new. (Fair resale value.)	240	
(9)	1	House, iron and softwood, two rooms and verandah. All second hand. (Low resale value.)	25	
(10)	1	Iron house, 3 rooms. New timber, second hand iron. (Low resale value.)	40	
(11)	1	Iron house, 2 rooms. Second hand timber, new iron. (Fair resale value.)	30	
(12)	1	Iron house, 3 rooms. All second hand. (Low resale value.)	30	
(13)	1	Iron house, 3 rooms. All second hand. (Low resale value.)	40	
(14)	1	3 room iron camp. Second hand. Taken over with leases. (Low resale value.)	30	
(15)	1	Iron hut. Second hand. (Low resale value.)	10	
(16)		Material for three staff houses cut ready for erection. New timber, new asbestos, second hand iron. (Good resale value while not erected.)	300	
		(Total for Buildings.)	1810	

STORES.

(1)		Standard Steel. It is of various sections and is scattered about the job. (It would have a low resale value.)	50	200
(2)		Mine stores, spare parts, etc. Without checking the individual items it can be said that they are present in the store to the approximate value indicated. In a break up sale, however, a large part of them would have to be sold with the particular machine for which they are suited. Rock drill parts, for instance, come into this category as pointed out elsewhere, and since they are scarce at the moment, the drills themselves would have to be practically given away if no parts accompanied them. Further, since stores are always a variable item, the amount shown will have to be heavily discounted from a sale point of view.	500	2500
		(Total carried forward.)	550	2700

	Brought Forward.	550	2700
(3)	Mine Stores. These are made up mainly of tinned foods, some clothing, and a small amount of perishables. The quantity varies quite widely, particularly in the wet season. (Their resale value in this country is high. Those that were present at the time of sale would bring close to cost price. The value shown for this item is at present roughly correct.)	1000	1500
	(Total for Stores.)	1550	4200
	Shafting, pulleys, bearings, belting, rock drill columns, hoses and clips, fitters and blacksmiths tools, tex rope pulleys and tex ropes. All pipes and fittings throughout plant.		
	This item appears to be in part a fabrication. The only parts of it not yet accounted for are rock drill columns, hoses and clips, tex ropes and some pulleys. Each machine in the mill is driven by its own motor through a tex rope drive, and there are therefore no countershafts and bearings. There is only one countershaft in the power house which furnishes power to the lathe and radial drill, but there are odd pulleys and bits of shafting on the scrap heap and various parts of the lease. The only bearings are those in the motors and on the elevators and spare elevator gear, all of which have been charged out at very high rates. The blacksmiths tools, of which there are very few, come under item (1) of Sundries, while some of the fitters tools on the job belong to the Company and some are the property of the fitters. Since the mill crushes dry, there is only a few feet of water pipe in it, which supplies water to flush out rejects in two places (see flow sheet). Other piping is used for suction ducts and has been made up on the job, some from flat iron and some from old drums, and its resale value is nil. Tex rope pulleys are keyed to their respective motors or shafts, and it would not be economical to remove them for sale purposes, and their value is included with the major unit. The value for resale of the rock drill columns, hoses and clips with some odd pulleys and shafting is only fair.	200	5500
1	250 K.W. Alternator and Starter recently sent up. This is a duplication of item (10) under Engines. (Note different prices for the same article on the same inventory.)	-	1400

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	Bag Elevator. As used by farmers. Complete with Engine. (In good order but has low resale value) here.	30	100
	Plant & Buildings, (freight and cartage) from Yinnietharra. No buildings from Yinnietharra have yet arrived on the job. Some pipe and rock drills have been brought in (and are accounted for elsewhere.)		4000
	All Switch Boards wiring, Electrical Instruments and Special starters, and other Electrical equipment. There are four small switchboards in the mill which carry twenty-four starters, a starter regulator and a phase switch, with fuse boxes and wiring. The starters have all been duplicated under "Motors." The main switch boards in the power house have three new kilowatt hour meters, about six second hand volt and Amp. meters, two Triple pole double throw switches, a breaker switch, and porcelain fuse holders with wiring and etceteras. The 250 K.W. alternator switch board is included in item (10) under "Engines" and new electrical equipment is included in "Mine Stores, spare parts." (Apart from items not duplicated, the electrical gear for resale purposes is not of great value. Several thousand feet of power line and house wirings with fittings would be included. The resale value would be fair.)	300	4000

EXTRAS.

Apart from the lots shown in the inventory, those below have been brought onto the lease.

1	Ross-Feeder with Richardson reduction gear and 3 h.p. motor. In good order, but not erected. (Fair resale value.)	50
1	Ore Bin. 14' x 10'. In good order but not erected. Fabricated steel. Sloping bottom, no stand. (Low resale value.)	50
1	Fine ore bin. 16' diameter by 15' high. Steel plate curved and punched for riveting or bolting. Good order. (Low resale value.)	50
1	Crab winch. Fairly old, but in working order. (Low resale value.)	5
1	Small D.C. Motor about 3 K.W. Just been erected in power house. (Fair resale value.)	10
2	Small wood and iron buildings. Second hand timber and iron. (Low resale value.)	20
6	New miners huts, wood and asbestos, but not erected. (Good resale value.)	150
	(Total for Extras.)	335

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SUMMARY OF ESTIMATED RESALE PRICES
AND INVENTORY PRICES.

	Resale	Inventory
Engines	7970	18435
Motors (Electric)	1000	2300
Motor Vehicles	100	600
Pumps	50	160
Tool Sharpening	440	1025
Rock Drills and Parts	900	1620
Sundry	4875	19510
Buildings	1810	9500
Stores	1550	4200
Shaftings, pulleys, etc.	200	5500
Alternator and Starter	-	1400
Bag Elevator	30	100
Switch-Boards, etc.	300	4000
Extras	335	-
	19560	68350

These values are for material that could actually be seen at either the Yampire or Wittenoom's Gorge leases. They do not include buildings from Yinnietharra, which have not yet arrived, nor the fuel tank which is to be erected at Point Sampson.

Though I have not read the terms of the mortgage, I understand that it was given over material on the Yampire leases only, and not on the Wittenoom leases. If this be so the value of equipment at Walters leases will have to be deducted from the figure shown.

The total resale value of all equipment on both leases is estimated at £19,560 in situ. It would, however, cost the Government a considerable sum to realise on the material, the usual figure being about 10% of the gross value, which in this case would amount to £1956, leaving a balance of £17,604. In round figures the break up value of the whole of the equipment is, in my opinion, not more than £17,500, and I therefore conclude that there is insufficient cover for the existing mortgage.
In addition there is security over the leases themselves

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M I N I N G.

The sedimentary rocks of the Nullagine series have been eroded to form many steep gorges, in the sides of which the fibre bearing rock has been exposed. The beds to be mined are therefore almost horizontal for the most part, and often difficult to approach when outcropping in almost vertical cliff faces high above the bottom of the gorges, as happens at the Company's Wittenoom Gorge leases. In Yampire Gorge, however, the terrain is only moderately rough, and it is here that the bulk of fibre produced to date has been mined.

The asbestos can be won either by benching on the face of the gorge or by driving into the hill, using underground methods of mining. The choice depends upon the amount of overburden to be removed in the former method, and this has been reasonable in the past so that benching has so far accounted for most of the production, though underground methods are being attempted.

In benching, the overburden is bored with rock drills to a depth of about 6 feet and the holes are charged and fired in the normal way. Due to the fact that it is horizontally bedded the rock tends to break in flat slabs and is somewhat more difficult to dispose of than normal broken rock. Disposal is now handled by a Diesel tractor and bulldozer which pushes the broken rock over the edge of the bench, and this machine is equivalent to 30 or more shovellers. The present output is almost entirely a function of the successful operation of the tractor and bulldozer, which is about 50 h.p., being the second largest size in a range of four sizes. It is quite often out of action for repairs, mainly due to the inexperience of the driver, who does not seem to realise that even such a rugged machine has its limits. Despite relatively high maintenance it still shifts the waste rock at a cost of a few pence per yard. Both maintenance and cost could be reduced if one of the largest models of machines could be secured. The steepness of the gorge face above the fibre bands is such that the width of the bench seldom exceeds 30 feet before the amount of overburden to be removed becomes too great to be economical by the present methods. In other places the bench can only be taken out to a width sufficient to let the motor truck through, which is about 10 feet, while there will be found a few places in which the overburden is too thick to make it economically removable at all. However, in a limited area near the main office it appears that a bench width of 50 or 60 feet may be possible.

After the fibre seams have been uncovered they are barred or sandblasted out and taken to the mill in a motor truck which passes right along the benches on the East side of the gorge where most of the mining is being done. Two faces are being worked on the West side of the gorge, where the broken rock is removed by hand since the bulldozer is fully occupied on the East side.

In these operations the workmen are on a contract basis, being paid according to the number of tons of bagged fibre produced from their ore. They were formerly paid by the fathom of rock broken, both overburden and fibre, but it was found that they were careless in sorting the ore from the barren rock, so that a high proportion of ore was pushed over the edge of the bench by the bulldozer.

Some development has been started in preparation for underground mining methods in the near future. The general idea is to develop a comparatively narrow strip right round the gorge faces, from which the ore will be extracted, using some sort of room and pillar method, with scrapers to pull out the waste rock and dump it over the edge of the bench.

From the point of view of anyone used to modern methods of breaking rock, the ore production side of both this undertaking and that of Australian Blue Asbestos in Wittenoom's Gorge has been handled in a manner which betrays inexperience of any but the most elementary methods. Mr. Foxall has noted on the file that Mr. Stubbs is a young man of considerable energy and ability, and this is quite true. He is actually however, a mechanical and electrical man and freely admits that before coming to Yampire Gorge he had had no experience whatever of mining methods, and knew nothing about asbestos. He says, quite frankly, that he wishes that Australian Blue Asbestos, who are further advanced with their underground work, would hurry up and find out the most economical form of underground mining, so that he could adopt it without the expense of experimentation. But Mr. Hancock, who manages the Australian Blue Asbestos project is a station man, with even less experience about a mine than Stubbs, so that it is a case of the blind leading the blind. Both Hancock and Stubbs are assisted on the mining side by men who hold shift bosses tickets. The point is that both projects have long passed the prospecting stages in which small quantities of ore were won by the simplest methods from the easiest places, and are now well beyond the capacity of the average shift boss. The problem to be faced in the future development of the asbestos industry in this State is purely a mining one. The metallurgical requirements of the undertaking are comparatively simple, since the separation of the fibre is an entirely mechanical process, and since the deposits are so large and regular the geological aspect is also relatively simple. It is an absolute certainty that neither Company will have a hope of success until they bring their operations under the constant supervision of an engineer with wide experience of modern mining practice.

Let us examine some of the mistakes of inexperience that have already been made and have caused much money to be wasted. It is well known that quarrying methods are cheaper than underground methods, and should therefore not be abandoned in favour of the latter until the last pound of ore has been economically won by these means. It is equally well known that long blast holes break much more rock per pound of explosive than short ones and this means lower costs. No more ideal place than the free face of one of these gorges could be found for the use of long blast holes, and yet all the miners that I have seen use short 6 foot holes as if they were working a narrow stope underground. Mr. Stubbs does not think that the long blast holes will work because the boring is too hard and the rock on the gorge face is cracked due to weathering, which would dissipate the force of the explosion. Both of these objections apply to the use of smaller holes which have to be bored and fired in the same, hard, cracked rock. By employing a small amount of special equipment, most of which is already on the job, an experienced man could do some real blasting and win some fibre at less than half its present mining costs. It is not claimed that copy-book blasting methods will work at the first attempt, but they can be adapted to suit the particular conditions only by one with the necessary experience and tenacity.

Even if large scale blasting could be brought to perfection the stage will ultimately be reached at which underground mining becomes the more economical proposition since the overburden attains a depth of up to several hundred feet in some places. The maximum amount of rock that can be removed economically from both between and above the fibre bands by large scale blasting methods is likely to be of the order of 30 ft. instead of about 16 feet by the present methods, and no underground mining should be attempted till the cheaper ore has been won.

The extra amount of ore that could be mined from the faces before underground mining is embarked on could be computed, but not until a complete survey plan of all faces has been made. Much of this ore has already been locked up both at Yampire Gorge and at Australian Blue Asbestos leases by erecting buildings of all descriptions at the foot of the faces, and this building is still going on. All buildings including the plant should have been located well clear of the working faces whatever the method used, but particularly when real blasting is to be done. In the computation of the extra fibre to be got from the faces, account will have to be taken of the fact that the gorge face rises above the fibre bands in benches. If the first bench rises 20 feet above the bands, and the second one rises 30 feet above the first, the overburden can only be economically taken off to the height of the first bench, that is, 20 feet, since at 30 feet, the estimated maximum economical height, no foothold could be gained from which to bore holes.

Though much fibre near the plant has been locked up to this method, there is another occurrence further down the gorge, which is at a different horizon, and is well clear of any structures. Very little is known about it, and it should be thoroughly investigated with a view to getting cheaper fibre than by underground mining higher up the gorge. The possibility exists that underground mining may not have to be tackled for years to come.

The proposed underground mining methods were apparently chosen so that scrapers could be used to obviate shovelling of the mullock. The idea was taken from a text book by Hancock and is being followed by Stubbs, and a few moments consideration shows that a scraper is about the most unsuitable of any mechanical contrivance on this type of work. A scraper does its best work when it can be set up at a fixed station and continually fed with dirt from a rill. Scrapers were in use at Mt. Isa under these conditions, being erected in a scraper drive which was bed by a number of rills from the stope above, and each scraper would handle tens of thousands of tons of dirt from the one fixed position. When narrow seams in a flat bedded deposit have to be mined, it is clear that large areas in a horizontal plane must be covered even for a small production. If scrapers are used to remove the dirt, this means much lost time in shifting, and a large number of scrapers, particularly when a bord and pillar system of mining is used. Every time a cut is fired new pin holes have to be bored and the scraper, which must be a portable one, has to be moved out of the way of the shots. Continued trouble is experienced with eye bolts which often pull out in the hardest of rocks and which take time to drive in. Great strain and wear comes on the ropes which rapidly deteriorate and have to be frequently replaced. In short, a scraper is not nearly flexible enough. The basic principle to be considered in the mechanical handling of dirt in a narrow flat bedded deposit is mobility. By coincidence, I have just received from the library the Bulletin of the Institute of Mining and Metallurgy for July 1945, which contains an article on scraping practice as used in a Spanish mine. Figures quoted show that in loading pyrites in upper cuts the actual working time was 2 hours 28 minutes in an 8 hour shift, while for scraping fill it was 3 hours 35 minutes in 8 hours.

Hancock's scraper is much too light and moves too fast and was probably designed for different material. To handle the slabby rock that is a feature of these asbestos mines a heavy slow speed scraper with short teeth would probably give much better results. Hancock's foreman tells me that the present unit, which is portable and runs on the mine tracks, is now no faster than hand shovelling. It is operated by air through a double drum scraper winch, and is used to bog out the drive faces.

An air operated mine car loader would be much more suitable in this case since it possesses greater mobility due to the fact. that no pin holes, ropes or pulley blocks have to be set up and maintained. Its conditions of operation are otherwise similar to the scraper, in that it must be connected to the mine air line, it runs on the mine rails, and has to be shifted back when blasting. There is a new mine car loader on the lease at Yampire Gorge, which has not yet been assembled.

Hancock is driving his levels 20 feet wide because it is plain that prices for this width at which contractors can make good money are less than double the prices for a width of 10 feet at which they could make the same money. He therefore considers that he is breaking the ground cheaply which is quite wrong. The object of any development policy is to open up an ore body in such a way that the later exploitation by stoping can be done most cheaply. The prime factor in development is speed, and no mine of any consequence ever attempts to combine half-hearted stoping methods with their development programmes. The advantages of speed are quite difficult to show on a financial balance sheet, while the doubtful advantage that has been indicated above is easily shown. Speed of development comes from keeping the drives as narrow as is compatible with the use to which they are to be put. One considerable advantage is that the dirt breaks finer and can be handled more rapidly than coarser dirt. Since the face is narrower the loader or scraper does not have to be moved as often as in a wide face. These two factors alone mean that considerable time and money are saved in handling the dirt, at a slightly greater cost for increase fracteur expenditure, a disadvantage which they greatly out-weigh. The principal reason why very wide headings mean wasted money, is that when the ore is broken from stopes, not more than one third of it is sent to the mill and the other two thirds, which is barren rock, is left in the stope, but in development headings all rock that is broken must be removed, and by the inefficient scraper.

Hundreds of feet of underground development for a bord and pillar system of mining has been started right from the face of the gorge, and advancing into the hill, both at the Australian Blue Asbestos, and West Australian Blue Asbestos Fibres leases, and the expenditure involved has been wasted to a large extent for the following reasons.

The economical exploitation of these deposits demands that the maximum possible extraction be got from any developed area. This statement postulates that no matter what the method used, it must be carried to the limit of safe subsidence, which will shortly be dealt with more fully. Since the gorge faces are everywhere quite precipitous it is obvious that directly under these faces ore extraction cannot be carried to anywhere near the limits of subsidence, which would cause the disturbance of large masses of rock on the faces. Various mine utilities have been built close to the faces which are now being so developed, so that rocks disturbed by subsidence would come down on travelling ways, smash up air lines and rails, demolish anything in their way, and be a constant source of danger to any one having to pass through the narrow gorges. To make sure then that such things do not happen only a small proportion of the ore developed by underground methods can be taken from near the gorge face, and its cost will be high. Seeing that there is such a large quantity of ore available this development is a waste of money, and should have been done well inside the hill where subsidence cannot affect operations outside. It is an attempt to save money on transport of waste rock but is ill-founded for the above reason, and also because a carefully designed stoping system will eliminate all

waste rock transport in stopes. The only rock that will need to be brought outside will be from development. It should be plain that if any further ore is to be cheaply won from near the gorge faces, it will have to be done by more efficient blasting methods as has been suggested in the early part of this section, which will leave the face clean and safe and not subject to subsidence. Extending into the hill from the new free face after this ore has been won, is a block of ore which will be costly to extract because as has been explained, it cannot be mined to the point of safe subsidence, and is therefore not economical to develop fully in the initial stages of underground operation. For safety the length of this block of ore will have to be the full length of the working face, and its width approximately twice the height of overburden. For West Australian Blue Asbestos Fibres this width will be approximately 200 feet, while for Australian Blue Asbestos it will be about 600 feet at their present workings. Though I do not agree with underground exploitation at this stage I think that it would have been further ahead than it is at a lower cost if these things had been taken into consideration.

The method of underground mining to be used has been the subject of much discussion which has resulted in initial attempts at bord and pillar practice. The rock at the gorge face is cracked by weathering and partly oxidised, causing odd soft patches. As the drive proceeds into the hill, the cracks and oxidation disappear, and at 500 feet into the hill, the rock is hard and dense. It can be broken so that both the roof and floor are almost perfectly flat surfaces, which have been exposed over long lengths, and widths up to 25 feet by the drives in Australian Blue Asbestos workings. The roofs when sounded with a bar give the response of good solid rock. The indication is that a cheaper method than bord and pillar, say longwall advancing, may be feasible. The solution of the problem is entirely dependent on the matter of subsidence which is dealt with fully in text books on coal mining, and these should be closely studied by anyone interested in mining in the Hamersley Ranges.

Coal seams are usually enclosed in such strata as sandstones, shales and clay, all of which are comparatively soft. If the seams are not too thick they can often be worked by longwall methods and the roof collapsed as the face advances. Such soft strata begin to subside almost immediately after the coal is taken away from under them, but the action of subsidence is comparatively gentle and can be controlled by experienced men.

The rock above the asbestos seams is very hard and brittle and will probably stand up over large areas, but no matter how strong it is, it cannot be indefinitely undercut without collapsing. Because it is hard and brittle it will probably stand up to the moment of failure, and then come down, which means that subsidence in the case of hard strata is anything but gentle and cannot be controlled nearly as easily as in the case of soft rock in coal mines. It would be quite impossible to let the roof down to the floor in the asbestos rocks, but this is not necessary. When the fibre seams are mined, up to one third of the broken rock is sent to the mill, leaving two thirds behind, which could just about fill the space occupied by the whole of the original solid rock. This broken rock could be back filled by an air operated bulldozer which would pack it right up to the back so that subsidence would be a minimum and under the proper conditions the workings would be as safe as any other underground workings.

Many ideas could be expounded along these lines, but in the hands of inexperienced miners they are apt to be dangerous, though if the lowest possible costs are to be arrived at they will have to be tried at some time or other.

The ratio of rock to be broken to fibre won is of particular importance in either quarrying or underground methods, as is the actual relationship between the fibre bands themselves. In some of the workings at Yampire Gorge the fibre occurs in two bands which are for the most part 8 feet apart and in this distance the fibre of all grades occupies about 3 inches on the average. In other parts of the leases the total amount of fibre is about 3½ inches and is confined in about 3 feet of rock, while other exposures show about 4 inches confined in about 2½ feet of rock. I have been told that near Marillana there is 9 inches of fibre in 3 feet of rock in one exposure. Though the number and length of individual seams varies quite widely, a steady average total length is maintained over large lengths of exposed seam. Some people say that the seams are continuous over a length of 60 miles, but one man, who to my knowledge has been working them for several years, said that they would cut out in another 50 feet into the hill. These statements represent the extremes, but the former is more likely to prove true in the long run. In the meantime, it is better to consider the deposit as a normal ore occurrence, and therefore subject to variation.

The minimum mining width is likely to be about 7 feet, since the days of slave labour are gone when men crawled on their hands and knees into narrow stopes, and in any event the use of modern appliances, which give lower costs than narrow mining by hand, demands reasonable head room. The average amount of fibre in this 84 inches seems to be about 3½ inches, or 4.16%. Some of it must be lost in both mining and milling operations even when efficiently carried out, and I would say that the overall recovery would be about 80% of the fibre. This means that in a mining width of 7 feet, about 3.34% of the rock broken is recoverable as marketable fibre of all grades, and for safety's sake estimates should be made on the basis of 3%.

Mining policy to date has been, as the result of inexperience, costly and extremely short-sighted, and this section can be summarised in the following terms. - Get somebody who knows something about mining.

MILLING PRACTICE.

At the end of this section a flow sheet is attached showing the sequence of operations at the present time. The principle on which the separation of fibre from gangue is based is that when the ore is crushed, the gangue which is hard and brittle, breaks down, maintaining at all times a granular form, while the fibre which is tough rather than hard, splits along two perfect cleavage planes, but retains its original unbroken length if not subjected to too rough a treatment. Thus the fibre eventually assumes a fluffy form and can be sucked off the screens by an air current, while the granular gangue passes either through or over the screens. In other words the milling process increases the ratio of surface area to weight, to a much greater extent in the case of the fibre than of the gangue, which allows a current of air of the right velocity to pick up the fibre and leave the gangue behind.

By comparison with smelting, roasting or cyanidation, as commonly used for gold or base metal ores, the extraction of the fibre is a simple matter. The processes referred to all involve chemical reactions between atoms and molecules, which cannot be observed, so that the actual results of any changes made are not determinable until some later time. On the other hand, the passage of asbestos bearing rock through the mill is observable at all stages, and the efficacy or otherwise of any alteration is immediately apparent. The operation is from start to finish, an entirely mechanical one of the simplest nature requiring neither chemicals nor water, and crushing finer than about 6 mesh is unnecessary, which means that fine grinding, the costliest operation in particle size reduction, is eliminated. For these reasons an asbestos milling plant should operate cheaper than almost any other treatment plant, provided that it is soundly designed and operated.

Turning now to the particular mill under consideration, we find that its maximum theoretical throughput at the present time is 4 tons of ore per hour, a limit placed on it by the machine of the smallest capacity, in this instance the 12" x 10" primary cracker. Here are some figures covering a production period of five months of this year.-

	1	2	3	4	5	6
	Ore Milled	Fibre Recovered	$\frac{2}{1}$	Milling Time	Possible Time	$\frac{4}{5}$
1945	Tons	Tons	%	Hours	Hours	%
April	246	46.00	18.7	61.5	720	8.5
May	270	53.5	19.8	67.5	744	9.1
June	357	80.0	22.4	89.2	720	12.4
July	546	96.0	17.6	136.5	744	18.4
August	361	77.0	21.3	90.2	744	12.1
Totals	1780	352.5	19.8	444.9	3672	12.1

Figures for September were not available, but I understand that they are similar to those for August.

Column 3 is arrived at by division of column 2 by column 1, and represents the ratio of fibre recovered to rock milled, but it is to be noted that the mill is only about 85% efficient, so that to get the actual percentage of fibre in the mill feed, the figures in column 3 should be multiplied by 1.176. Thus for the period the average of fibre recovered to ore milled is 19.8%, but the average percentage of fibre in the mill feed is 23.2%.

Column 6 comes from the division of column 4 by column 5 and gives the percentage of time that the mill was in actual production. These figures immediately attract the attention since they show that over a period of five months the mill was in production only 12.1% of the time, with 18.4% as the best figure for any one month. This, of course, means that fibre production has been at best only 18.4% of the theoretical maximum. It is admitted that very few plants ever operate near their theoretical maximum, as calculated from machine capacities, as has been done for the above figures, but on the other hand, any reasonably designed and erected plant can be made to operate for very close to the theoretical maximum time at a somewhat reduced machine capacity. The present plant falls very far short of either objective for a variety of reasons which will now be examined.

When I first inspected these leases some 6½ years ago, a small mill was being operated by Mr. I. Walters on the site of the present mill, which has been built up by alterations and additions to Walters' mill, using some new and some second hand equipment. These additions have been made for the most part during the last eighteen months and have been rushed so that fibre production could begin. The result is that, from a mechanical point of view, the plant is an extremely poor affair, on which the amount of maintenance work required to keep the wheels turning spasmodically is out of all proportion to what it would have been if reasonable care had been exercised in its erection.

The routine of the past four days since our arrival here has been for 5 or 6 men to work on it every day from 8a.m. till lunch time. It is started up about 2p.m. and shut down about 10p.m. and I am informed that this is the usual practice. It might be expected that, with a maintenance period of several hours every day, the plant would give reasonable service during the eight hour period of operation, but such is not the case, as stoppages occur quite often. Yesterday the Jaques rolls (20" x 10") caused a shut down, while the day before the Traylor cracker bogged up. Such mishaps require up to two hours before a clearance can be effected. Time is also lost when the evening meal is taken, and when the crackerman lets up for any reason, such as to roll a cigarette, since the cracker, and so the whole of the mill, is hand fed, as will be seen from the flow sheet which shows that the mill does not possess a bin of any description. The feed therefore surges from choking point to nothing at all several times during the shift.

The mill is operated on contract by a group of three men, who work on any day of the week, including Sundays, on which the wheels can be persuaded to turn. The advantages of the contract system are well known, but it is very doubtful whether they are economically sound in the present instance. The Company usually supplies the contractor with the tools to do the job, and stands the cost of the wear and tear on those tools. Sometimes a shovel worth a few shillings is the only tool needed, while at other times a machine and equipment worth several hundred pounds must be supplied. In the case before us, a complete milling plant worth several ~~thousand pounds has~~ been put at their disposal, but must be maintained by the Company. Few contractors ever take any real care

of gear supplied to them, since they do not have to pay for its up-keep, and the ones in this case are no exceptions. I noticed gear wheels out of normal reach, running perfectly dry, and some conveyor idler pulleys were squeaking, which means that at some future date the already difficult problem of maintenance is likely to be increased at the Company's expense.

A major consideration is the dust menace, and when the air in the gorge is stagnant, and the plant is in operation, the conditions are simply appalling. These conditions were experienced on two evenings within the period of my visit, causing a pall of dust to hang in the gorge for a distance of a quarter of a mile either side of the plant, and yet the men assure me that conditions have improved since my last visit. I have given the Manager to understand that further improvement must be made immediately at the expense of production. The men themselves are aware that their health may rapidly deteriorate under such conditions, and I have taken pains to explain to them the action of the dust particles on the lungs. Despite this, they are reluctant to wear the respirators, which were supplied to them by the Management, and a number of which can be seen thrown into odd corners. They say that respirators are hot and sweaty, and quote numerous other disadvantages, all of which are true, but are, nevertheless, far outweighed by the one advantage of health protection. This attitude towards respirators is quite universal on all the mining fields of my experience, so that the solution of the dust problem resolves itself into the willingness of the Management to accept the responsibility of seeing to it that the various machines release as little dust as possible into the atmosphere. Both time and money have been spent to this end, but improvements are often nullified by wrong placement, slipshod work, and lack of understanding of the simplest technical principles. Attempts have been made to collect dust from the various machines by blocking off open spaces and introducing either a 4 inch or 6 inch diameter straight suction line. This supplies a strong suction over a small area and collects dust only over that same area, but causes eddy currents in adjacent areas which disperse the dust through open spaces which cannot be blocked off. The strong suction also picks up heavy particles which are not harmful to health, and deposits them in the main suction duct, where the velocity of the air current is low. I have pointed out that by using an evasee type of take off, of calculated dimensions, instead of a straight pipe, any required velocity of air can be got over a reasonably large area at each machine, using the present fan. Two simple principles are involved. Firstly, dust is released when rock is crushed and particularly when that crushed rock falls freely through the atmosphere, and collection apparatus must be installed in such positions, which are usually at the output end of the crushing machines, and the heads of any conveyors. The second principle is that the collection apparatus must be designed to give a low velocity of suction over as large an area as possible, rather than a high velocity over a small area, causing the defects outlined above. If these principles are complied with, the dust problem will be completely solved.

What little dust is now collected through the straight pipes and choked main duct passes through a fan and is delivered into a tank 10 feet in diameter by 6 feet high, which is about 30 feet away from the mill. The top of this tank is wide open, so that if the wind is in one direction, it blows the dust back into the plant, while if it is in the other direction, the dust descends on the mess and men's camps. It will have to be collected and settled at this point by means of a spray tower or a bag house or a combination of both. In general, the elimination of dust has been treated as an after-thought which is wrong. Anyone constructing a dry treatment plant of any description must realise that dust control is the major principle around which the rest of the plant is designed.

Some trouble has been caused in the mill due to electric motors burning out, which is probably largely attributable to the dusty conditions of operation. Very fine dust gets into the windings of the motors and forms on them a coating of appreciable thickness. Since the dust is a poor conductor, the motors tend to overheat, so that if a peak load be placed on an overheated motor, due to a surge of feed, that motor may easily burn out. The alleviation of dusty conditions is therefore likely to assist in this respect, quite apart from the fact that it will mean that working conditions for the men will be much more tolerable.

You may have noticed from the flowsheet that No. 3 is the only grade of fibre being produced. As far as possible, the crude ore brought to the mill is of this grade only, but no matter how carefully it is picked, it must always contain some of both No. 1 and No. 2 grades, which are not at present separated, but go into the bags and are sold as No. 3 grade. I have asked Mr. Stubbs why the higher grades have not been separated and stockpiled, seeing that the major costs of fine crushing have already been borne to make possible the extraction of No. 3 grade. His reply was that he had been instructed from Perth not to collect the higher grades since there is little demand for them, and that this applies particularly to the No. 2 grade, which is also more difficult to collect than the No. 1. He further stated that there is a small but spasmodic market for No. 1, and that odd small lots have been sent away, and also that he could separate this grade in the mill by "simply pressing a button" to use his own words. This policy seems to me to be shortsighted in the extreme, and indefensible on any grounds whatever. Instead of letting the No. 1 grade go out in the cheaper No. 3 grade, it appears that it could be collected and stockpiled at a cost of a couple of shillings a bag. Probably a wire will be received at some future date for a consignment of No. 1 grade, and special arrangements will have to be made to get it, whereas it could be building up every time the plant runs, if the trouble were taken to collect it. I have noted on the flow sheet the position at which the collection of No. 1 grade could be made.

During the period of our visit, the mill feed seemed to be somewhat poor, averaging about 1% fibre, which is lower than is desirable. If, however, the feed exceeds 2% fibre, a great deal of trouble is experienced with the screens and cleaning arrangements. Technically the object should be to strive for a plant which will handle a much richer feed, since the gangue is of more than average hardness and imposes severe wear on all surfaces with which it comes in contact. The optimum feed with the present set up is considered to be from 20 to 25%, and the maximum output is put at 130 tons per month working one shift only. The figures quoted at the beginning of this section agree as far as feed is concerned, but indicate that a higher output should be possible, though even the lower figure has not yet been approached in the best month (July) which gave a production of only 96 tons.

It appears that pressure from Perth office for increased production with second hand gear poorly erected, are the root causes of poor mill results. Clearly, a plant can't be in production and under repair at the same time, but I am of the opinion that it would have paid to have shut the plant down months ago, for a fortnight, and put every possible man onto it to correct as many faults as could be done in the time, and so eliminate some of the lost time. If it were then run for the second half of the month, it would have treated as much ore as it did when running the whole month before correction. In short, the grinding of the last revolution out of any plant before repair, causes both a loss of production and increased costs.

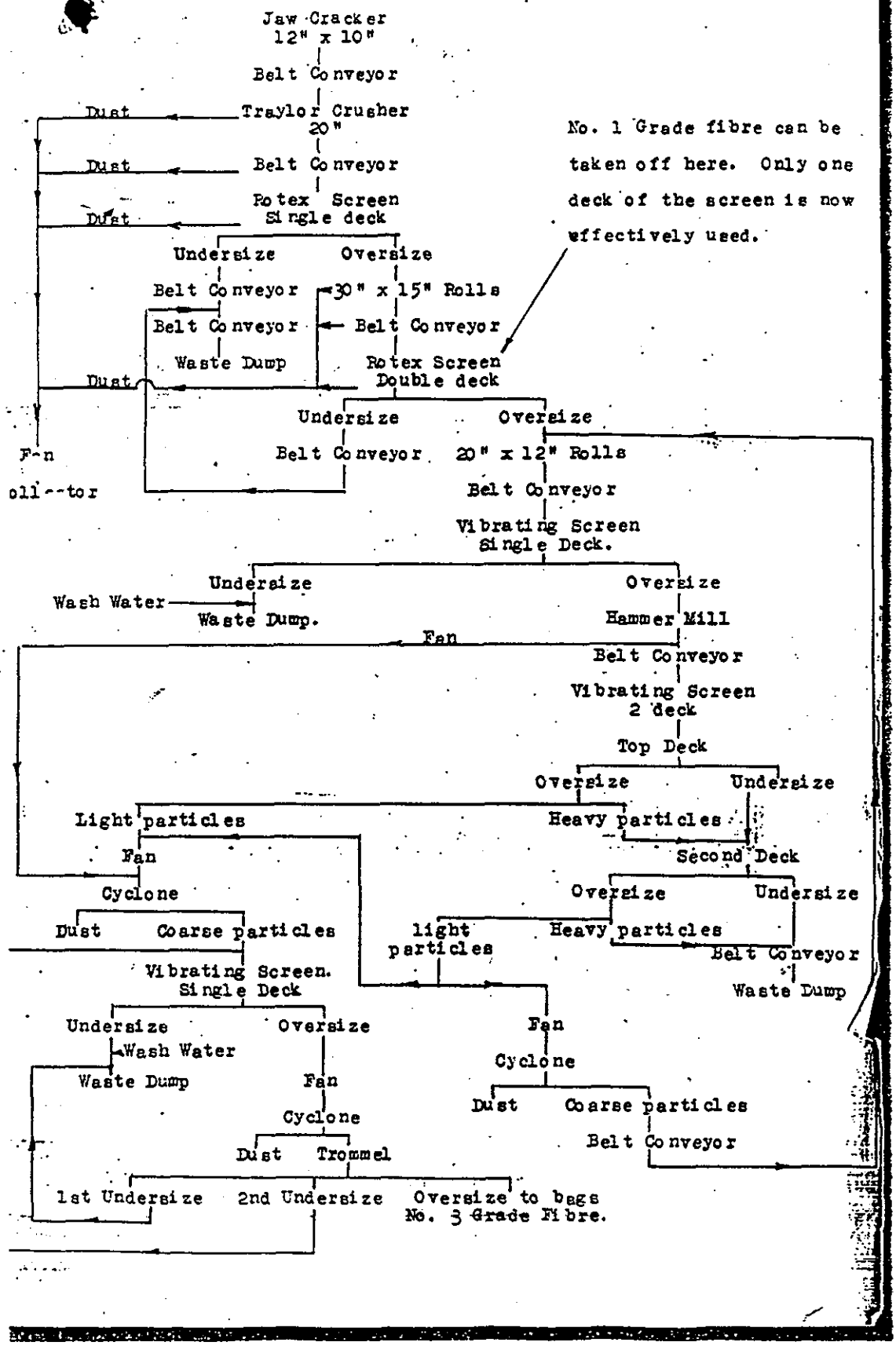
The plant was, however, forced to close down on the 8th instant due to the fact that the shells of the second set of rolls were worn out, and one of the brasses was cut right out. Another set of shells is expected, but the exact date of arrival is not known. During the waiting period some essential alterations are to be made, and have already been put in hand. The fan which sucks material from the top deck of the double deck vibrating screen and delivers it to the cyclone, has been removed and put on the other side of the cyclone. The rotor had to be refaced and rebalanced every few days owing to the abrasive action of the gangue. The new arrangement will mean that this wear will be eliminated since the material will no longer pass through the fan. The rolls referred to above have been entirely removed and will be fitted with a new shaft, bearings and shells, and set up higher on their foundations, which will cut out spillage at the Niagara screen which causes dust and lost time for removal. These rolls are too small for the job, and should be replaced with a larger set. Screens are being repaired and dust collection apparatus re-designed.

A bin and large cracker are to be placed in front of the existing small primary cracker so that feed will be automatic which will eliminate some lost time and fluctuations of feed. A picking table is also to be installed so that barren rock can be sorted from the feed, which will decrease useless wear on machines. The last two items will probably not be added during the present shut down since the time will be too short.

Such improvements, though beneficial as far as decreasing lost time and therefore costs, cannot eliminate inherent faults in mill design. The plant has been erected on a perfectly flat site built up at a considerable cost in time and money, in a location which is almost entirely made up of steep slopes, one of which should have been selected for a mill site. The result is that in quite a small mill housed in a building about 80 ft. by 30 ft., we have no less than nine separate conveyors. Again, since the rock to be handled is so hard, much wear is to be expected and its effects will be felt particularly on second hand machinery. This means that provision must be made for the rapid changing of worn parts, but this is now impossible because the machines have been cramped together so that they are hard to get at.

A brief summary of this section on milling follows. The plant is a very poor affair in which everything has been mistakenly sacrificed in the name of production. The output could be greatly improved, at the cost of temporary loss of production, if time were allowed for obvious faults to be corrected in a workmanlike manner. Owing to faults in design and poor machinery, this plant will probably never be made to produce continuously, at or near its theoretical maximum output. If a large increase in production is required, an entirely new mill of reasonable design and construction will be necessary. Notwithstanding its present condition the plant is able to cope with mine production which is quite low, but if it is to be stepped up, the plant will become a hopeless bottleneck.

FLOW SHEET OF W.A.B.A.F. MILL



C O S T S.

	April 1945		May 1945.		June 1945		July 1945		August 1945	
	Ore	Fibre	Ore	Fibre	Ore	Fibre	Ore	Fibre	Ore	Fibre
	246	46	270	53.5	357	80	450 96	72 24	338 23	72 5
Development & Extraction.										
Yampire	208.4	1114.8	211.4	1067.2	181.4	809.6	82.7	520.2	135.1	634.3
Walters							217.9	853.7	505.6	2325.7
Milling.										
Yampire	74.2	396.6	63.7	321.6	44.2	197.4	37.4	234.8	47.1	221.4
Walters							37.4	146.5	47.1	216.7
Ore Transport										
Yampire	-	-	-	-	-	-	6.7	42.6	-	-
Walters	-	-	-	-	-	-	30.0	117.5	-	-
Fibre Transport	-	-	-	-	-	-	.8	15.8	3.7	17.3

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These figures are taken from an extract of costs supplied to me by Mr. Blockley, who gave me to understand that book-keeping methods at the mine are such that they were only arrived at after considerable difficulty, and are not guaranteed to be of the usual accuracy that can be got from a well kept set of books. Mr. Blockley's figures have been reduced to shillings and decimal points of a shilling, and his average costs omitted, as they are not required for the purposes of the examination to follow. He has noted as follows:-

"The - sign means not shown separately."

"Figures represent expenses to produce fibre to loading point on mine."

"Figures do not include depreciation."

"Figures refer to long tons of ore, but short tons of Fibre."

I understand then, that the figures take no account of Perth office expenses, capital expenditure, or depreciation, but represent the actual cash spent on production for such items as labour, fuel for engines, and similar expendable stores.

It is to be remembered that the figures in the table relate to tons of ore sent to the mill, and that this ore is won by sorting from a larger mass of broken rock. We can reduce the costs shown to tons of rock broken so that they can be compared with other types of mining, for the essence of any mining operation is the breaking of rock at the lowest possible cost.

At Yampire Gorge, the 450 tons of ore was produced both by mining from the gorge face and by underground mining, but no record has apparently been kept of the amounts produced separately by either method. At the time of our visit, six parties were producing from the benches, but only one from underground. Some of the bench parties were assisted by the bulldozer, which disposed of their waste rock quickly and cheaply, while others disposed of their waste by hand, and the proportion of fibre produced from the benches was high. I would estimate that in July, probably 400 tons came from the benches, and the remaining 50 tons from underground. On the benches, about 16 feet thickness of rock was broken, of which 2 feet represented fibre bearing ore, while underground the same amount of ore came from the mining of a thickness of 8 feet. Thus the 400 tons of ore from benches came from the breaking of 3200 tons of rock, and the 50 tons of underground ore was derived from 200 tons of rock.

At the Wittenoom Gorge, or Walters' leases, 96 tons of ore were got from both methods, and since no bulldozer is available for removing waste rock from benches, it is done by hand, so that the ratio of ore produced from benching as against underground is not nearly so high as it is at Yampire. I would put it at not more than 3 to 1, which means that 72 tons of ore came from the benches and 24 tons from underground. The figures for ratio of ore to rock broken are also slightly different as the 2 feet thickness of fibre bearing rock can be got underground from a mining width of 7 feet, as against 8 feet at Yampire, while the 16 foot maximum remains the same. The 72 tons of ore from the benches came from 576 tons of rock, and the 24 tons from underground came from 84 tons of rock.

The following examination of costs will be confined to the figures for July, since they are the most complete and represent the best monthly performance to date. They can now be set out in the following manner:-

JULY, 1945.

	Tons			Shillings per ton.		
	Rock	Ore	Fibre	Rock	Ore	Fibre.
Mining.						
Yampire						
Benching.....	3200	400	64	10.3	82.7	520.2
Underground.....	200	50	8	20.7	82.7	520.2
Walters						
Benching.....	576	72	18	27.2	217.9	853.7
Underground.....	84	24	6	62.3	217.9	853.7
Milling.						
Yampire.....		450	72	4.9	37.4	234.8
Walters.....		96	24	5.4	37.4	146.5
Ore Transport.						
Yampire.....		450	72	.9	6.7	42.6
Walters.....		96	24	4.4	30.0	117.5
Fibre Transport...			96	.4	2.8	15.8

Mr. Blockley's figures covering mining are given under the heading of development and extraction which are normally separated. It is not easy to define development and extraction in the case of benching from a free gorge face, but it should be easy for the underground workings. Strictly speaking, all underground work done to date should be classed as development. In general, the system of recording at the mine seems to make the accurate determination of these items separately a waste of time.

The figures show that though rock is broken from the bench more cheaply than from underground, the costs per ton of ore and fibre are the same. The figures of 82.7 shillings and 217.9 shillings per ton of ore really represent average costs of production by both benching and underground methods, but as no record has been kept of the tonnage produced by each method, an examination of costs to see whether the economical limit of benching has been reached is impossible. The limit is postulated in the figures at about 2 to 1, and is the observable limit beyond which the Manager has apparently decided that he cannot go before resorting to underground mining, with which I disagree entirely.

MINING COSTS.

Benching.

At Yampire the cost was 10.3s. per ton of rock broken, and 27.2s. per ton at Walters', and the difference is almost entirely accounted for by the use of the tractor and bulldozer at Yampire Gorge to remove waste rock after it has been broken. The machine pushes the broken rock over the edge of the bench, and can handle slabs of the size that would require secondary blasting if they had to be disposed of by hand. Even at Yampire the tractor cannot reach all of the working faces and as many as four of them are still being worked by hand. At Walters' leases, all faces are entirely hand worked. At times the tractor is out of operation for repairs, so that all faces at Yampire are on occasion hand worked. Clearly, the advantages of modern earth moving equipment are demonstrated here, and if all disposal were done by these means costs could be greatly reduced. The advantages of these machines would be particularly great in large scale benching methods as suggested, which could not be very well carried out without them. At least one more bulldozer of the largest size should be put to work immediately, and if long blast holes are to be used, two more bulldozers would be necessary. Costs can only be cut by further capital expenditure. Such economies will greatly increase the ratio of overburden that can be removed, and thus bring large tonnages of ore into the more straightforward field of benching. Other factors in favour of benching are that almost no development is required and no ore is left in pillars as will have to be done to a more or less extent with any underground method. Once the method of benching is established, together with its economics based on sound book-keeping, the operator can tell after a few minutes examination whether a certain fall will pay to strip or not. Benching on a large scale can only be undertaken in locations favourable to the rapid disposal of waste, that is where the fibre seams are high above the bottom of the gorge. The deposit near the mill at Yampire is dome shaped and dips below the floor of the gorge at either end so that near these points disposal would become difficult. In this respect the deposit further down the gorge appears more favourable.

Underground.

At Yampire the cost was 20.7s. per ton of rock broken, and 62.3s. at Walters, and it is difficult to see why the difference should be so great. At both places the dirt is bogged by hand into trucks and dumped over the edge of the bench, since the proposed scraping system has not yet been put into operation at Yampire Gorge. The Gorges are steeper, the ground tighter, and supervision is more difficult at Walters, but these disadvantages are insufficient to cause the breaking of rock to cost three times as much as by similar methods at Yampire. Allowing that all work to date is development, it is reasonable to assume that when stoping is started the costs will be less than they have been, but I have pointed out elsewhere that a large proportion of the ore already developed will have to be left in pillars for safetys sake, so that if the present methods are continued, the drop in cost when stoping starts is not likely to be more than two or three shillings per ton under existing conditions. Reduction of costs can be brought about by increased scale and the use of mine car loaders in place of hand methods, particularly in development faces. Modern rock drills with automatic feed and withdrawal will also save time and money in underground methods for it must be remembered that all dirt will be broken by machines rigged on bars and not a single sinker machine with its rapid steel changing advantages, will be required. Areas to be mined

will eventually be extensive so that transport of supplies will become a consideration. Machine steel will be one of the principal items under this heading, and the economics of the use of rip or jack bits in place of conventional steel will need to be investigated.

MILLING COSTS

Ore from all sources was costing 37.4s. per ton to mill, but costs per ton of fibre were considerably less for Walters ore than for Yampire, because for the month of July the grade of the former ore was much higher, though it is to be noted that in August, the grades, and therefore milling costs, were roughly the same.

These costs include bags at 44s. per short ton of fibre, which should be capable of reduction. Bags used are new cornsacks which are now apparently kept by the buyer. They contain a maximum of 80 lbs. of fibre, so that it takes about 26 of them to make a short ton. Arrangements have now been made for them to be returned, and it is expected that they may be used about four times before being discarded. To reduce bagging costs, it was proposed to consign the fibre in bales like wool, but the buyers objected. To get 80 lbs. of fibre into a cornsack requires constant ramming, which is at present done by hand, and is a full time job for one man while the mill is operating. When they leave the mine the bags are well distended, but I am informed that when they arrive in Sydney they are quite flat, and as much fibre again could be got into them. It therefore seems that a mechanical type of press would be an advantage in enabling say, 120 lbs., to be put in one bag. It should be possible to reduce bagging costs by 50%.

The first essential in decreasing milling costs is to increase the tonnage handled thus reducing overhead expenses, but this cannot be done until many faults have been remedied, and maintenance reduced. The longer these improvements are delayed, the more money will go down the sink. The installation of the bin and Ross feeder will be the next greatest money saver since it will give a steady feed, and thereby both greater capacity and efficiency. Dust control will also cut milling costs by decreasing wear on bearings and increasing the efficiency of the mill operators themselves. Hand sorting is to be tried and should eliminate some waste rock. I regard the putting of the mill in order as the No. 1 priority on the job. It has been a great money waster, and yet its faults are obvious to everyone who has had anything to do with it. Their eradication is simple and results of improvements are immediately determinable, which is not so in the case of alterations in mining methods.

A capacity of at least 1,500 tons of ore per month is a reasonable expectation from the present mill after correction of the faults enumerated.

ORE TRANSPORT.

Costs 6.7s. per ton of ore at Yampire and 30s. per ton at Walters.

This work is done on contract by a man who possesses the only good truck on the job. At Yampire, the truck passes right along the bench that has been cleared by the bulldozer and picks up the ore at the working faces. Where hand mining is in vogue, the ore is sent down a slide to the bottom of the gorge and is picked up from here by the truck. The truck dumps all ore for hand feeding to the mill cracker, and the maximum haul is now less than half a mile.

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At Walters' the ore is sent from the benches to the bottom of the gorge by flying fox and is dumped on the ground from where the contractor loads it by hand into the truck. It is carted 35 miles to Yampire and then again dumped about a quarter of a mile from the plant until it can be treated, when it is hand loaded into the truck and dumped at the cracker site.

Costs could be cut by using bins instead of dumping on the ground. Small ones of bush timber would have paid for themselves over and over again.

FIBRE TRANSPORT

This cost is 15.8s per ton of fibre from all sources. Fibre is bagged as it comes from the mill and is stacked nearby. It is later removed to the opposite side of the gorge to the point where the Roebourne transports load and unload. After being weighed here, it is again stacked and loaded by hand when the transport arrives. A site is now being built up at the mill itself, where the bags will be weighed and stacked and then loaded direct to transports. This cost should thus be cut to about 5s. per ton of fibre for branding, sewing, weighing and stacking bagged fibre.

COMPARISON OF YAMPIRE & WALTERS COSTS

JULY, 1945.

	Shillings Per ton of Rock.		Shillings Per Ton of Ore		Shillings Per Ton of Fibre	
	Yampire	Walters	Yampire	Walters	Yampire	Walters
Mining.....	10.3	31.7	82.7	217.9	520.2	853.7
Milling.....	4.9	5.4	37.4	37.4	234.8	146.5
Ore Transport..	.9	4.4	6.7	30.6	42.6	117.5
Fibre Transport.	.4	.4	2.8	2.8	15.8	15.8
	16.5	41.9	129.6	288.1	813.4	1133.5
	16/6	£2.1.9	£6.9.10	£14.8.2	£40.13.2	£56.13.7

It is plain that mining accounts largely for the high cost of production at Walters' leases. Mechanisation and better mining methods would reduce costs here to about the same extent as at Yampire if the scale of operations were similar.

The cost of ore transport however, cannot be reduced to any extent, since the price is 7d. per yard per mile, or approximately 4¾d. per ton mile which is very low for the North West. This means that fibre from Walters' will always cost £3.15. 0 per ton more than from Yampire under present conditions. It is being carted 35 miles to the Company's mill, from a point within 1 mile of C.S.R.'s mill. Mr. Stubbs tells me that the mill in Yampire Gorge is only a pilot plant and the intention is to erect another mill at Walters, though he did not say how this was to be financed. The object of this is to do away with carting, and to get the benefit of the better grade of ore at Walters'. On a mining field

of this magnitude and nature the erection within one mile of each other, of two separate mills by two different Companies is as economically absurd as is the carting of ore from a point one mile from one mill, 35 miles to another mill.

Mr. Stubbs informs me that the intention now is to take the Browett and Lindley compressor and the Vickers Pétters Diesel Engine and erect them to supply air at Walters' leases, where air is now being furnished by the Dorman Ricardo Portable and the Holman compressor. The Browett and Lindley machine was to have been erected at Yampire and excavations for the foundations are almost completed. If this move is carried out, Yampire Gorge is dependent for its air on up to four small machines, to wit, the Dorman Ricardo Portable (150 c.f.m.), the Holman Portable (150 c.f.m.), the Broome and Wade (220 c.f.m.) and the Holman (220 c.f.m.). To leave Yampire, which has supplied the bulk of the production to date, dependent for its air on such a doubtful array of small units, seems quite senseless.

Ore from the benches at Walters is sent to the bottom of the Gorge in flying foxes, and recently a miner lost his life when the ascending bucket hit him. This was an unfortunate accident, and was caused by the deceased turning the brake wheel the wrong way and not getting clear of the bucket as the shouted warning of his brother, who was working with him, advised him to do. The fox is now being replaced by rails and skips at considerable expense, and with the idea that they are safer. I fail to see why the flying fox should not be just as safe if operated with ordinary care. The appliance itself is quite a solid affair with about half inch steel cables, and is a vast improvement on the foxes with which all fibre was lowered without mishap only a couple of years ago. These contraptions consisted mostly of old petrol drums with a few strands of fencing wire in place of the cable.

The freight on the compressor and engine, excavation and pouring of foundations, erection of engine house, engine, compressor, and cooling tower, together with the completion of the rails up the side of the Gorge, will represent a capital outlay of about £2,000. In view of the urgent need to recondition the mill at Yampire, and the fact that nobody on the job has any clear idea of competent mining practice, this expenditure is entirely unwarranted. The outlay of this money at the present time will only help to perpetuate the costly errors that have already been made at Yampire, at an even greater cost as is indicated by the production figures. The object should be to cut both mining and milling costs immediately, and to this end I would immediately close down Walters' leases, and concentrate on Yampire, at least until such time as a clearly defined mining programme and costing system have been established at the latter place. It is admitted that Walters' leases possess certain advantages, the principal of which is that a higher percentage of fibre and a better proportion of longer fibre can be got from them, but the Company is not in a position to be able to make use of them. The longer fibre is of no importance at the present time since there is no sale for it, and it is not even being recovered from present mill feed. If a survey is made to see what fibre can be got by better benching methods, Walters' leases should be included, because there is more room for rapid disposal of large quantities of waste rock, and to date no structures of a permanent nature have been erected below the faces which would be damaged by flying rocks.

MINE TO FREMANTLE CHARGES.

Costs incurred in getting the fibre from the mine to Fremantle are as below:-

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	£ s. d.	Miles	Per Ton Mile.
Mine Store to Point Sampson	3.15. 0	220	4.1d.
Point Sampson to Fremantle.	2. 8. 3	1000	.6
Point Sampson Charges	7. 7		
Fremantle Charges.....	6. 5		
Insurance.....	5		
Total.....	£6.17. 8		

The figures were supplied by the Company and are for short tons of fibre.

The road transport to Point Sampson is done by the most modern trucks available. These are petrol driven Whites and are almost new. With trailer they take a load of 10 tons of fibre over a road which is in good order, but has a few very steep hills on it. There is a possibility that the distance to Roebourne could be shortened by about 40 miles by the construction of a new section through extremely rough country, but this work is not likely to be put in hand for a long time to come, since a very large sum of money has been spent on the roads in this area over the past two years. A slight reduction in freight may be brought about by larger output and the use of Diesel trucks, but it is clear that the figure of 4.1 pence per ton mile is cheap in an isolated area like the North West.

The same applies to the shipping figure of something more than a halfpenny per ton mile, and I note from the file that efforts to have this figure reduced were unavailing. In general the above figures are unlikely to be very substantially reduced in the near future, and improvements in costs must be sought at the mine, as has been noted by Mr. Telfer.

FIBRE RECOVERY

Losses of the sought after mineral occur in any mining operation, principally in the treatment processes, and to a smaller extent in the extraction of ore from the mine.

The Yampire mill has an efficiency of about 85%, and it is estimated that about 5% of ore is lost in mining operations, and the following tables are based on these figures

1. Mill Recoveries.

	Ore Milled	Fibre Recovered			Fibre in Ore		Fibre Lost
	L.T.	S.T.	L.T.	%	L.T.	%	L.T.
Yampire							
Benching	400	64	57.1	14.3	67.3	16.8	10.2
Underground	50	8	7.1	14.3	8.4	16.8	1.3
Walters							
Benching	72	18	16.1	22.3	18.9	26.3	2.8
Underground	24	6	5.4	22.3	6.3	26.3	.9
	546	96	85.7	15.7	100.9	18.5	15.2

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2. Mine Recoveries.

	Rock Mined	Ore Recovered		Ore in Rock		Ore Lost	Fibre in Lost Ore	
	L.T.	L.T.	%	L.T.	%	L.T.	%	L.T.
Yampire								
Benching	3200	400	12.5	421	13.2	21	16.8	3.5
Underground	200	50	25.0	52.6	26.4	2.6	16.8	.4
Walters								
Benching	576	72	12.5	75.8	13.2	3.8	26.3	1.0
Underground	84	24	28.6	25.3	30.1	1.3	26.3	.3
	4060	546	13.5	574.7	14.2	28.7	18.5	5.2

From these two tables, a third can be taken showing total losses and amounts of fibre in situ.

3. Fibre Losses.

	Fibre From Rock		Fibre Losses			Fibre in Rock	
			Mill	Mine	Total		
	L.T.	%	L.T.	L.T.	L.T.	L.T.	%
Yampire							
Benching	57.1	1.8	10.2	3.5	13.7	70.8	2.2
Underground	7.1	3.6	1.3	.4	1.7	8.8	4.4
Walters							
Benching	16.1	2.8	2.8	1.0	3.8	19.9	3.5
Underground	5.4	6.4	.9	.3	1.2	6.6	7.9
	85.7	2.1	15.2	5.2	20.4	106.1	2.6

S.T. = Short Tons. L.T. = Long Tons.

Mill Recovery.

The mill feed for the month of July, 1945, contained 100.9 tons of fibre of all grades, of which, 15.2 tons was lost in tailings. This is not as serious as it would appear at first sight, for it should be recalled that only No. 3 grade was produced, there being no market for Grades 1, 2 or 4. Normally grades 1 and 2 are taken off at an earlier stage than grade 3, as the air current can pick them up after less fiberisation, and therefore less damage to the fibres. They are now being picked up with grade 3 after fairly complete fiberising, which means that their recovery is high with some small loss due to damaged fibres. Fiberisation is at present adequate for the more or less complete recovery of everything up to Grade 3, but not for Grade 4, which therefore goes out onto the dump, and forms the largest percentage of the 15.2 tons lost.

Though a good plant could be expected to give a more efficient recovery of all grades than this one, the losses shown above are not worth worrying about until reasonable operation of the plant on a throughput basis is assumed, and a demand for grade 4 fibre comes to hand. Mill fibre losses will be slightly increased when hand picking is introduced, since even a careful workman may throw out a large stone with a small amount of fibre in it.

Mine Recovery.

Both rock and fibre bearing ore are horizontally bedded and break into flat slabs when fired. Firing, however, must be done separately if maximum recovery of ore is required, and this is a disadvantage to be constantly faced, particularly in underground mining methods, where it will cause loss of speed in both development and stoping. Losses of fibre occur in both firing and hand sorting, but with care they should not exceed 5%, and may be much less. If faces were broken out in one firing as in gold mining, the recovery would be very low, the longer grades practically all destroyed, and the sorting would become laborious. The type of cut used in firing development faces will have some bearing on this matter. Centre cuts often blow the collars off of nearby holes which would cause appreciable fibre loss in places where there are bands of fibre on both the top and bottoms of the drive, as happens in the Yampire leases. Workmen on contract will shoot the fibre out to save time rather than bar it out at extra effort. Barring out of the fibre gives rise to the minimum losses but there will be relatively few occasions on which it can be used. Even after shooting the surrounding rock away, the fibre bands are often quite intact. This is noticeable after a few feet beyond the original weathered gorge face, when the rock is fresh and compact.

MARKETING

Here we are faced with the most important single factor in the large scale development of the blue asbestos deposits of this State. Briefly the position is that large overseas combines have had absolute control of the world's markets at least up till the time the war broke out. Buyers have been cautious about going outside of the combine for their requirements to a producer whose future output is doubtful, as if they are forced back on the large producers they will probably get a poor deal. The new producer is faced with a deadlock, since the buyer wants to be sure of continued supplies before he will give an order, and the producer wants a large order before he will go to the expense of erecting machinery and starting mining. Since the combine has large stocks available at all times the new producer must give way and conform to the potential buyers demands. Normally he must undertake large expenditure and be prepared to stockpile fibre until he has considerable reserves. The war moderated these conditions to a large extent since asbestos became a strategic mineral, and as shipping was not available the overseas firms were unable to get their product into Australia to the usual extent. The war time conditions were responsible for the present operations in the Hamersley Ranges and the object now should be to retain and expand the advantage gained during the war years. The coming of peace is likely to bring with it the same conditions of marketing that existed before the war, that is, lower prices and tighter markets with the larger producers prepared to indulge in price war-fare to squeeze out the new man. It has been said that to overcome this possibility, the Government could put a tax on imported asbestos. Future conditions of world trade are now being decided and are not yet clear, but they will not be greatly affected by the requirements of a small part of a nation of seven million people. For example Great Britain may request Australia to allow free entry to all Canadian and Cape Blue Fibre that we can absorb, in return for

which she would guarantee to take all surplus wheat from us at a fixed price satisfactory to our farmers. Such an arrangement is not beyond the bounds of possibility and would be of immense benefit to Australia as a whole, but would not brighten the future prospects of the North West of this State. In short future trade agreements cannot be foretold at this stage.

The desirability of accumulating stocks of fibre has been referred to and on it is based my criticism of the selling of No. 1 and 2 grades with No. 3, and making no attempt at separate recovery after having met the major expenditure involved; that of fine crushing.

I was under the impression that C.S.R. were accumulating their current production for future use in their Building Material Division, but this appears to be incorrect. Mr. Broadhurst of the C.S.R., who was managing the Australian Blue Asbestos Company while Mr. Hancock was on holiday, told me that they had no accumulated stock and were unable to comply with orders.

I have noted from the file that Wunderlichs have given an order for a large consignment and that Indian buyers are enquiring, but that an export license has not yet been arranged on behalf of the latter buyer. From the producers angle, a long term contract provides the best stimulus to production, and it would be interesting to know the reactions of both of the above buyers to the suggestion of such a contract, in place of large orders at indefinite intervals. One cannot get away from the feeling that they are at present making use of this State's producers and will probably go back to the combine as soon as possible. In support of his application for further assistance Mr. Faye has advanced as one of his principle reasons, the plea that he does not want to lose markets so hardly won. I am of the opinion that though hardly won, they are lightly held.

It seems to me that the marketing field is one in which the Government could render some assistance. The highest authority should inspire the greatest confidence and should be brought to bear, particularly in such cases as Import licenses, which are soley a Government function. It has been suggested that the financing of stockpiling be done by the Government, but this would require a large sum of money, for which Federal assistance would probably have to be sought.

The use of blue fibre in place of white in manufacture of asbestos board seems to give some promise of increased marketing, though the position is yet to be clarified. It appears that some manufacturers claim that it is better in some respects than white, while others say that it is quite useless.

One thing must be borne in mind by those interested in asbestos production, and plans for the future must be based on it. It is, that the present prices will show a sharp decline in the near future. This will take place within a few months in my opinion, and I expect the drop to be of the order of one third.

Generally, it seems that at the moment the demand exceeds the supply, at a price favourable to the producers, even though they are unable to make use of it at present, but the future will probably bring less favourable conditions.

It is suggested that the largest Australian consumers be approached and requested to name the conditions under which they would give Australian producers a long term contract, say not less than seven years, for the whole of their requirements, the contract to come into force two years hence, which would allow time for expansion of production to the required dimensions.

their terms would no doubt be stiff, but if the stiffest of terms bring a guaranteed market, they are preferable to the hand to mouth existence of the past.

This probing of possibilities for the future would at least give us some idea of what we are up against, but right now everybody is completely in the dark. It should be undertaken immediately and is likely to be treated seriously if it emanated from the Government. The quality and quantity of the fibre available is such that if it is exploited along the right lines, it will stand the toughest set of conditions that any buyer could frame.

Recently an engineer said to be representing consumers apparently made a fairly close inspection of the mines. If I remember rightly, his name is Stroud, and one must assume that his report to his mentors will remark on the inadequate handling of the production side to date, which will cause a disinterested attitude on the part of potential buyers, which is a great pity, but will continue just so long as people ignorant of the arts of mining continue to have charge of the project.

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POLICIES.

The policy of Australian Mines Management and Secretariat who, I am told, manage this undertaking on behalf of Austmac, a de Bernales family concern, seems to me to be beyond comprehension, and without a vestige of logic.

They have a Chief Mining Engineer, and yet the mining side of the business is in a hopeless mess. They also have a Mechanical Engineer, and the mill is a nightmare of maintenance problems, and a menace to safety. There seems to be an accountant but not the elements of a costing system, and there is a surveyor, but almost nothing is known of quantities of ore available for benching. Some of these people pay periodic visits by plane to the mine for not more than a day or two. I asked Mr. Stubbs why the former two officials could not spend a period of say several weeks with him, and help to straighten things up. They are always too busy with work on another of the Group's mines, and yet Mr. Faye claims when he wants a loan that it is of very great importance that the North West be populated through the establishment of the asbestos industry, which is a case of running with the hare and hunting with the hounds.. It surely is important to populate the North West and establish a new industry which will benefit the whole of Australia, and just as surely could these busy officers devote a few weeks of their time to the cause, at the expense of the other mines which are mostly gold, and are well established already.

They appoint as Manager, a man who had never seen an asbestos mine, and had no experience whatever of mining operations and methods, and leave him to his own devices to extract ore by underground methods in a flat bedded, hard, siliceous ore body, an operation that has rarely been performed on a large scale in Australia. This man, Mr. Stubbs, seems to be the only genuine one of them all, and has worked like two men to get the thing going to the best of his ability. In return for this he is continually badgered from Perth for more production, though his fortnightly reports, copies of which I have read, should tell the tale of mill maintenance problems to anyone. He is supposed to keep costs within bounds, but has not the faintest idea of what some things are costing as invoices are seldom sent to him. I noticed that he had a fresh copy of the inventory supplied to us for the purposes of this investigation and he wrote to Perth Office protesting that such items as a £14. jig entered at £650. made him look a fool.

What can one think of the two inventories in which prices for the same article are doubled or halved or vice versa, and on which everything possible is duplicated? By what process of logic are the items listed at the mine by the man responsible for their use, but priced in Perth by someone who has obviously never even seen some of them?

Mr. Faye claims that gear has been obtained from Associate Companies at reduced rates. The International Utility came from the Kalgoorlie Foundry, an associate company, and is about a 1935 model, and had done more than 100,000 miles. It is shown on the inventory at £300. and arrived on the job about last January when it could not possibly have been worth more than £150, and is now worth about £50. I suspect that the price of £300. is contrary to National Security Regulations. Four new sets of conveyor head and tail pulleys with shafts and bearings are charged at £500. per set. They are new and probably came from Kalgoorlie foundry, but are much too heavy for requirements at Yampire, and could not have cost the price shown. They are not necessary since there are two other spare second hand sets on the job.

In my view the inventory is a complete fabrication, for which this Department is entitled to some explanation. Whether it was done deliberately or through gross carelessness makes no difference, for people who conduct their affairs in either manner are not worthy of a moment's consideration. There is probably a set of books somewhere in the Perth office of the Company, which would tell the true story, and it would be interesting if Mr. Mockley could examine them. In any case, he should be instructed to check up on the item of £4,500 for plant buildings, freight and cartage from Yinnietharra, if he has not already done so. These items came from a Government source, and records of their sale should be available.

The shortcomings of the whole undertaking quite obviously originate in the Perth office of the Company. Shortage of Manpower and shipping difficulties are made to cover a multitude of sins. They are very real problems in the North West. The interval between boats has been as high as sixteen weeks, and good miners are scarce even in peace time, as they prefer the amenities of places like Kalgoorlie, to the crudities of Yampire Gorge. Lack of manpower is the major reason why instead of being hurried a job should be properly done in the first place, thus reducing maintenance, and the want of shipping cannot be made to explain why information is with-held from the Manager, or why the field officers attached to Perth office cannot stay on the mine long enough to straighten out some of the mistakes which are obvious to the least of the workmen.

In dealing with applications for assistance by this Department, I have always based my recommendations on the principle that it is better to lend money to an honest man with a fair show, than to a rogue with a first class one. In this case we are dealing with a proposition of uncertain future, operated by interests who have shown by their handling of the present application and the expenditure of the £25,000. that they are unreliable. Anyone who lends money under these circumstances is playing with fire and must expect to get burnt. There are however exceptions to every rule, and the present application could under some circumstances provide the exception to my general rule. If the establishment of the asbestos industry could be given a reasonable chance of success by the granting of a subsidy as applied for, I would not hesitate to recommend it even though I knew the money would never be recoverable.

Mr. Telfer has expressed disagreement in principle with the idea of a subsidy, with which I concur, particularly in the present instance. We are asked to subsidise weak policy, poor methods of production, and inexperience, which would be throwing money away. If such a subsidy is granted to the present applicants it will be immediately claimed by C.S.R. and we would have very little grounds for equitable refusal.

I am not convinced of the good faith of the present applicants and they have apparently neither the experience nor the tenacity to overcome their present difficulties. Their solution of the problem takes the line of least resistance, for if someone can be persuaded to put up the money, they can carry on for a time at least, with the same slovenly methods, but with even less chance of ultimate financial success. It would be folly to grant any subsidy at the present stage, and any industry that requests a subsidy should automatically accept the onus of proof that it is being carried on at the maximum efficiency before applying for such subsidy.

Any assistance granted now, whether in the form of a subsidy or a lump sum, and which allows past methods to be carried on, will be a waste of money. Falling prices combined with these methods will eventually force the mine to shut down, and will give the industry a bad name to add to its original difficulties.

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SUMMARY.

1. The undertaking should be in the hands of one experienced in modern mining methods, as it is primarily a mining problem, as distinct from a metallurgical, geological or mechanical one.

2. The mill must be put in order immediately, and brought to the stage where it can be relied on to operate continuously with the minimum of maintenance. To carry on with the mill in its present state is to lose both money and production.

3. The scale of operations must be stepped up to a stage approaching maximum mill capacity.

4. A survey must be made to determine what quantity of ore is available for benching by more efficient means at each deposit at Yampire, and also at Walters'.

5. Underground development at the gorge faces should be stopped immediately.

6. Benching should be stepped up even by present methods, but waste disposal must be by bulldozers.

7. Shut down Walters' leases until cheaper methods have been established at Yampire.

8. Prohibit erection of mine utilities near any working faces.

9. Some social services in the form of erection of huts and houses already on the ground must be undertaken.

If these things are put in hand production can be more than doubled, and costs cut by at least 25% on July figures, in a few months, provided that the few items needed can be got onto the ground quickly. Some production could be got at the same time, but further capital expenditure to the tune of, perhaps, £15,000 would be called for, not, however, for the liquidation of debts incurred in the past.

I have noted that both of the present operators in the Hamersley Ranges have to date failed financially to make a success of asbestos mining at the current high prices, and that this failure is due primarily to lack of mining wisdom. Mr. Broadhurst of C.S.R., when I asked what happened if the price dropped severely, as it well may, said "We shut down," though perhaps this statement should not be taken as carrying the authority of the principal executives of C.S.R.

Even those closely associated with asbestos production in this State are full of the idea that we can never compete with "Cape Blue" fibre, produced by native labour. A few moments consideration will show that this belief is quite groundless, and I am convenced that with proper handling, the Hamersley products will hold their own on a World market without any form of subsidy whatever.

The supposed cheapness of native labour is a mistaken idea. Cheapness is always reflected in costs per ton, and anyone who cares to take the trouble of consulting "The Mining Magazine" of London, will see that costs on the Rand, which employs all native labour are appreciably higher than those of our major mines, such as Lake View and Wiluna. The only advantage of native labour is that it is usually plentiful, but Rand operators are now denying this.

Apart from labour, to enable Wrold competition, we require a deposit of vast magnitude, and everyone who has seen the Hamersleys, soon forgets his original intention of trying to estimate how much fibre is available, because there is so much and indications of so much more, that it would be quite worthless and unnecessary to pursue enquiries along these lines. The Government Geologist in Bulletin 100 has noted that our deposits seem similar in all respects to the South African ones, which I understand are also very large.

Therefore we have in the Hamersley Ranges a deposit of similar magnitude to, and probably of better quality than, any other known deposit, and we can breat ore cheaper than the country possessing the rival deposit, particularly if we use modern mechanised methods. Therefore in a price and marketing war, we are holding the whip-handle, since the indications are that we can produce more cheaply. The third requirement to enable World competition is to get a major organisation interested, and when C.S.R. came in I was of the opinion that the economical development of the Hameraley deposits was a foregone conclusion. I have been amazed and disappointed at their poor showing, though I have learnt to expect anything from a de Bernales undertaking.

Surely an organisation with the resources and industrial experience of C.S.R. must know that a dangerous calling like mining can not be prosecuted economically on a large scale by amateurs.

Both Mr. Broadhurst and Mr. Hancock have told me that the Company has tried "so called mining experts," and are now content to pay for the formers mistakes. This must be very nice for these two gentlemen, but the outlook for the future from a State point of view is bleak because of it. To date C.S.R. has paid for the experience of their asbestos executives, and very dearly, yet they have not paid in full as they will shortly see, for Mr. Broadhurst's blithe admission "we shut down," may come true in the very near future. They have apparently not however, benefited from the experience which has cost them so dearly, for there is one lesson to be learnt from it. It is that the profession of a Mining Engineer, particularly from the angle of skilled and experienced underground operation, is not an attractive one, rushed by fond parents with ambitions for their curly headed boys. The reasons are obvious, and the result is the top flight mine operators in Australia are extremely few, though they are often aped unsuccessfully by "so called mining experts."

I say to anyone that likes to listen, that the Hamersley Range asbestos deposits, in the hands of men of the calibre of Lake View's J. F. Thorne, or Wiluna's H. E. Carroll, would easily hold their own on a World market, and could shut down "Cape Blue" if it were necessary to carry competition to these lengths.

C. Adams

CUE.
24th October, 1945.

INSPECTOR OF MINES.

I wish to acknowledge, with thanks, the willing co-operation of Mr Blockley in this matter.

C.A.