Western Australia.

FORESTS DEPARTMENT.

PAPER-MAKING MATERIALS.

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PAPER-MAKING MATERIALS.

THE shortage and high price of paper during the war period, and the knowledge that the world's supply of those materials that for a generation or more have been the basis of the world's paper output is in danger of being exhausted has everywhere drawn attention to the necessity for finding additional fibrous matter for the purpose. Western Australia, like the Eastern States, possesses many fibres from which paper can be made, but long and patient investigation is necessary before it can be determined from what materials it is possible to manufacture suitable papers at a cost which would justify their employment. It would seem that all the Australian States suffer alike in this matter. Each possesses many materials from which paper may be made, but there are inherent difficulties in most cases in transforming laboratory experiments into commercial practice. Sometimes the material is in short supply and difficult of cultivation; at other times the supply would seem to be abundant, but considerations of labour and transport render their utilisation impossible from a financial point of view. In Western Australia spinifex has been experimented with, and has been found to make a suitable paper for many purposes, newspaper, for instance, and, although there are many millions of tons of the material scattered over the Northern and Eastern sections of the State, the difficulties connected with collecting the same and getting it to a port of shipment are such as to make it unprofitable as against imported materials of equal, or perhaps, better quality. Many grasses have also come under observation, and samples of one of those from the Northampton district, known as *Ecdeiocolea monostachya,* were submitted to the Imperial Institute, London, which reported that the yield of pulp from the material when air dried was 44 per cent., as against that of 52 per cent. for the commercial esparto grass. The samples of paper made from this were equal to many papers now in use, but the supply

of the plant itself is so limited that as a commercial proposition it is neglible. Investigations are now being conducted into the question of paper-making materials by the Advisory Council of Science and Industry in Melbourne. In Western Australia independent investigations have also been undertaken with some local Eucalypts. The most promising of these is Karri. From laboratory experiments with young Karri very satisfactory newsprint has been made, and it cannot be doubted that similar pulp treated with proper machinery for preparing and calendaring will produce results in paper of the class used in books and magazines. A large parcel of young Karri will probably be sent to a pulping establishment in Canada for a report. If that report be satisfactory, and it is proved that paper on a commercial basis can be produced from Karri, a great step will have been taken in the matter of producing good paper in Australia. Karri is probably the quickest grower amongst the Eucalypts, and, strangely enough, its most rapid period of growth is during the first 20 or 25 years (as much as 500 cubic feet per acre per year being observed), and it has been found that young Karri is a very much better material for pulping than the wood when of more mature years. There is abundant Karri forest and land in suitable districts in Western Australia for the cultivation of young Karri on a 10 or 15 years' rotation, so that if this material turns out satisfactorily there need be no doubt as to the supply of Karri for future paper-making operations. Experiments have also been conducted with a mixture of Karri and certain fibrous grasses and sedges found in abundance in the regions in which Karri is found. The result has been eminently satisfactory, and a good quality of paper has been produced in the laboratory. It was also ascertained that the reddish brown colour natural to Karri wood is eliminated at a comparatively low expenditure of bleach, and a perfectly white paper is the result. Until a Forests Products Laboratory undertakes the work, the extent and variety of materials suitable for paper-making in the Western Australian forests will not be known, but so far experiments into the matter are all of a promising nature. The investigations have been in the hands of Mr. I. H. Boas, chemist of the Technical School, and here are the results as furnished by him:—

> "Of the two outstanding processes whereby wood is converted into cellulose pulp for paper-making and the like, the Sulphite Process is practically exclusively used for the pulping of resinous woods, whilst the Soda Process is used on the grasses and non-resinous material.

"In the experiments carried out on local materials under my direction, the unsuitability of the Sulphite Process to these raw materials has been borne in mind and the Soda Process has been exclusively used.

"Briefly, the production of pulp by the latter method may be described as follows:—The wood in the form of crushed chips is fed into digesters with the requisite amount of alkali—caustic soda—solution and boiled under steam pressure for a period depending on the nature and condition of the raw material, generally four hours and upwards. Spent liquor is then run off and the material thoroughly washed to remove the soluble products of decomposition. Thence it is transferred to machines which tease the particles or fibres out from the bundles in which they are still aggregated. Bleaching of the grayish to brownish pulp is then carried out by means of solutions of chloride of lime (Bleaching Powder), and when this has gone sufficiently far and the desired degree of whiteness attained, the pulp is again washed and, after the very important beating stage which follows, is ready for the 'machine' to convert it into 'sheet,' etc.

KARRI SUCKERS.

8-year growth.

"The 'cut' per acre of this material is estimated at about 133.5 tons, a cord weighing (green) 6,670lbs. From laboratory results it has been calculated that one acre of this growth should yield approximately 38.5 tons of unbleached pulp, or 36.5 tons bleached material.

"The table attached will indicate clearly the gradual decrease in pulp yield as the tree matures and also the increased consumption of 'bleach' following the same course. Alkali consumption appears to reach a maximum at a definite age, remaining constant afterwards for green timber. It will be noted that the mature timber ('Mill Waste') shows a slightly lower consumption of soda, possibly due to bleaching during seasoning in the open."

Raw Material.	Pulp. % Unbleached.	Yield. % Bleached.	Loss of Weight on Bleaching %.	Bleach Consumed % 3rd B.P.	Soda Consumed % Caustic Soda.	Fibre dimensions. Length L	Diameter D	Ratio D / L	Pressure lbs. sq. inch.	Soda strength (concentration) at start.	Time, hours.
8-year "suckers"	48	45·5	5·2	4·0	19.5	1·0	.016	·016	80	4·4	6
15-year saplings	44	41·4	5·6	4·8	22·8	1·0	·015	·015	82	4·72	6
20-year saplings	38·8	37·2	4·1	6·5	22·8	1·02	·016	·015	100	5·2	6·5
Mature trees "Mill Waste"	40·7	38·0	6·7	7·4	20·4	1·0	·014	·014	80	4·8	6
Gahnia Decomposita ...	31·9	28·7	10·0	9·8	26·4	1·25	·008	·0066	90	4·76	6
Cladium Preisii... ...	25·7	23·0	15·0	35·0	19·0	2·5	·015	·006	100	7·5	6·5

Note the effect of stronger solution and higher pressure on the yield in the case of the "20-year" material.

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