David Scott Mitchell.

TECHNICAL EDUCATION SERIES, No. 6.

DEPARTMENT OF PUBLIC INSTRUCTION:

TECHNICAL EDUCATION BRANCH—F. BRIDGES, *Superintendent.*

WATTLES AND WATTLE-BARKS,

BEING

HINTS ON THE CONSERVATION AND CULTIVATION OF WATTLES

TOGETHER WITH PARTICULARS OF THEIR VALUE.

BY

J. H. MAIDEN, F.L.S., F.C.S., &c.,

CURATOR OF THE TECHNOLOGICAL MUSEUM, SYDNEY;
CONSULTING BOTANIST TO THE FOREST DEPARTMENT OF N.S.W.;
PRESIDENT OF THE FIELD NATURALISTS' SOCIETY OF NEW SOUTH WALES;
AUTHOR OF "THE USEFUL NATIVE PLANTS OF AUSTRALIA,"
&c., &c.,

WITH TEN ILLUSTRATIONS.

SECOND EDITION.

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INTRODUCTORY.

(To First Edition.)

THIS little work is the practical outcome of many years of research and observation in the subject matter on the part of the Curator of the Technological Museum, Sydney. It has been prepared and is being published at the present time at the request of the Department of Public Instruction, which has recently assumed the direct control of Technical Education in this Colony. It is hoped that the information sought to be diffused will direct attention to, and will stir enterprise in, the cultivation of the more valuable wattles. The experiments in wattle culture in Victoria and South Australia have resulted in practical success, and in the latter Colony the industry is being carried on with increasing vigour as a profitable pursuit. There is no sound reason why similar good results should not be achieved in New South Wales, which has in many parts both soil and climate well adapted for this special culture. Success in this industry means a vast increase in productive wealth to the Colony, and in view of that fact I feel that the public should receive the full benefit of whatever information may be in the possession of this Department.

J. H. CARRUTHERS,

Minister for Public Instruction.

30 *May*, 1890.

I HAVE perused Mr. Maiden's Wattle Pamphlet, and have much pleasure in recommending it as an excellent Treatise upon the subject of Wattle Cultivation generally.

J. EDNIE-BROWN,

Director-General of Forests.

Forest Department,

Sydney, 22nd July, 1891.

PREFACE TO THE SECOND EDITION.

THIS pamphlet is issued to supply farmers, tanners, merchants, and others, with authentic information in regard to the value of wattles. The demand for good wattle bark becomes greater every year, while the supply does not cope with it. The cultivation of wattles is not a theoretical matter; it is easy, remunerative, and has already entered the domain of practical farming. Australia is the native country of wattles; they will grow in the poorest soil, and some require only a moderate rainfall. Their cultivation is strongly recommended to farmers who have a patch of poor soil which they cannot otherwise profitably utilize. The return is in about five to seven years, and attention to the wattle plantation can be chiefly given in the spare hours which are available on every farm. Farmers in some districts could be recommended to put as much land as possible under wattle, provided they had the means to wait. At present only the following wattles are recommended to be planted:—

> The South Australian Broad-leaf Wattle, *Acacia pycnantha*, and the various varieties of *Acacia decurrens*, generally known as Black or Green Wattle.

At the same time, reference to the detailed information given in regard to other wattles will show that many of them are worthy of conservation if farmers have them on their land, and further experience may show that some are even worthy of local cultivation. The wattles specially mentioned, however, with their extended geographical range and proved value, are sufficient for all practical purposes at present.

The First Edition of 2,000 copies was applied for in less than six months, not only by residents of every Australian Colony and New Zealand, but by correspondents in many parts of the world, especially European tanners and American extract makers.

The present edition is practically a new work, and will be found to contain a mass of information in regard to the utilization of wattles which has never before been got together. This result has only been possible on account of the abundance of material I have obtained and worked at during the past season, and the generous co-operation of persons engaged in various branches of the industry.

I desire to express my obligations to Mr. R. T. Baker, Assistant Curator, and to Mr. H. G. Smith, Laboratory Assistant, for valuable help.

J. H. M.

Technological Museum,
Sydney, April, 1891.

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Part II.

LIST OF ILLUSTRATIONS.

WATTLES AND WATTLE-BARKS.

Meaning of the word "Wattle."

In Webster's Dictionary (see also Skeat) a wattle is defined as a twig or flexible rod; a hurdle made of such rods; a rod laid on a roof to support the thatch. Hence, when used as a verb, it signifies to bind with twigs; to twist or interweave (twigs) one with another; to plait, to form of plaited twigs. It has the same derivation as the word *wallet*, both being from the Anglo-Saxon *watel*, a hurdle covering; in Middle English signifying a bag; the verb is *watelen*, to wattle, twist together, strengthen with hurdles. It is a matter of common knowledge how small trees were used in the manner indicated in the above definitions, in the erection of various structures in the early days of the Colony. *Acacias* were undoubtedly used (with other small trees), and it is interesting to the student of language to note how, in Australia, the word wattle has now become practically synonymous with *Acacia*.

The Rev. Dr. Woolls, however, assures me that the earliest application of the word wattle was not to an *Acacia* at all, but to *Callicoma serratifolia*, Andr., a small tree belonging to the *Saxifrageæ*, and which is generally found near watercourses. It was probably abundant along the course of the streams which flowed into "Sydney Cove;" and in the earliest records of "dab and wattle" structures, the tough saplings of this species were alluded to. It is called "black wattle," at page 201 of vol. iii of Don's work on Dichlamydeous Plants, published in 1834. The compact round heads of flowers have a general resemblance to those of wattles, and I have on more than one occasion, when out in the bush, been asked by an unbotanical companion, "What kind of wattle is this?"

Demand and Supply.

As regards the importance of a supply of wattle bark to European manufacturers, and the remote possibility of the market being over-supplied, I quote the following, by a correspondent of Mr. J. E. Brown, when Conservator of Forests of South Australia:—"The matter of supply and demand

can be compressed into small compass. British and Continental tanners are languishing for ample and continuous supply, and South Australia exports in such driblets that very many of the large firms in great Britain have given over using it, falling back on Valonia, and other barks more *fully* and *regularly* supplied. I may be allowed to remark here, reliable leather cannot be produced by intermittent and inadequate supply of bark, on which the tanner relies when laying down his hides; indeed, in large yards, such as with 50,000 hides always in the pits, it become a very serious difficulty, attended with anxiety and loss, not to be able, through want of sufficiency of bark of a class, to work them through successfully. It therefore becomes a matter of necessity that the exports of bark may be abundant and regular to such an extent as tanners may confidently rely on. To such low export of wattle-bark have your growers now arrived at, that *one yard* could manage to take fully *one-fourth*—say 1,000 tons—of all the bark shipped from your ports to England in 1882, and about one-third of the shipments for 1883. . . . I am aware French and German tanners highly approve of the wattle for tanning purposes." (*Report to S. A. Legislative Council*, 1884.)

Throughout Australia the species of wattle richest in tannic acid are becoming seriously diminished, and there is a consensus of opinion amongst persons interested in the matter that the various Governments should encourage the replanting of them. At the same time there are some species which tanners despise (partly because the introduction of them would disturb the routine of their operations), which are even richer than some of the tan-barks in common use in Europe and elsewhere, and there is no doubt that, sooner or later, our local tanners will have to fall back upon these second-grade wattle barks, unless the cultivation of good wattles is actively entered upon.

In regard to Tasmania, which has hitherto supplied so large a quantity of good wattle bark, Mr. F. Abbott, Superintendent of the Botanical Gardens, Hobart, says:—"We have so many wattle trees growing naturally, that we have had no need to cultivate them in Tasmania, but the destruction is so great we shall have to do it before long." (*Acacia decurrens.*)

Mr. F. Donovan, representative of the Tanners' and Curriers' Union of Melbourne, in giving evidence before the Royal Commission on Vegetable Products, states that for the bark which in 1872 cost £3 15s. per ton, £8 or £9 was paid in 1887, and he is very emphatic on the necessity of wattle culture on a large scale. Mr. Dunn, a tanner, gave evidence to the effect that in 1872 wattle bark was selling from £2 10s. to £3 a ton. In 1879 the price had gone up as high as £9 10s., and since then it has varied from £8 10s. to £11; in 1887, the best bark was £10. (*Acacia decurrens.*)

The best Sydney black or green wattle bark (*Acacia decurrens*) fetched £10 last season, and this appears to be the top price on the average.

I am indebted to the kindness of T. Coghlan, Esq., Government Statistician, Sydney, for the following figures:—

WATTLE BARK.—IMPORTS AND EXPORTS.—AUSTRALASIA.

IMPORTS.—QUANTITY.

Colony.	1885.	1886.	1887.	1888.	1889.
	Tons.	Tons.	Tons.	Tons.	Tons.
New South Wales	4,471	4,225	3,713	3,429	2,633
Victoria	5,029	3,912	2,410	2,954	3,422
Queensland	1,057	1,212	1,395	1,510	1,587
South Australia	104	53	5	.....	.....
Western Australia	.....	.....	.....	.....	.....
Tasmania	.....	.....	.....	.....	.....
New Zealand	4,323	4,233	2,963	3,056	3,111

EXPORTS.—QUANTITY.

Colony.	1885.	1886.	1887.	1888.	1889.
	Tons.	Tons.	Tons.	Tons.	Tons.
New South Wales	2,609	2,705	1,799	1,689	2,742
Victoria	2,115	3,302	1,733	4,105	4,454
Queensland	6	48	2	.....	50
South Australia	4,442	4,732	5,638	4,189	3,643
Western Australia	.....	.....	.....	.....	.....
Tasmania	12,287	12,030	9,689	7,814	10,574
New Zealand	47	78	36	220	162

IMPORTS.—VALUE.

Colony.	1885.	1886.	1887.	1888.	1889.
	£	£	£	£	£
New South Wales	37,131	33,673	27,467	29,080	21,964
Victoria	42,468	33,069	19,107	27,087	32,417
Queensland	7,799	8,127	8,534	12,454	13,172
South Australia	1,746	421	58	.....	.....
Western Australia	.....	.....	.....	.....	.....
Tasmania	.....	.....	.....	.....	.....
New Zealand	45,581	42,511	28,040	31,195	35,088

EXPORTS.—VALUE.

Colony.	1885.	1886.	1887.	1888.	1889.
	£	£	£	£	£
New South Wales	19,279	19,621	11,802	13,534	21,391
Victoria	21,563	30,782	16,152	41,410	45,666
Queensland	60	396	13	.....	150
South Australia	43,825	51,176	56,987	41,299	42,979
Western Australia	.....	2	43	.....	30
Tasmania	83,580	79,606	60,898	61,829	87,248
New Zealand	383	402	196	1,117	798

Mr. W. M. Orr, of Sydney, has kindly supplied me with the following information :—" Approximately the sales of bark per week in the Australian Colonies are as follows :—

New South Wales	150 tons.
Victoria	200 „
Queensland	50 „
South Australia	50 „

The following old statistics are of interest:—" In 1843, 3,078 tons of mimosa bark were shipped from Port Phillip to Great Britain. The price then realized in the London market was £12 to £14 per ton, but it has since (1854) declined to £8 per ton. The price of chopped mimosa bark in Australia, for export, at the close of 1846 was £2 5s. a ton. Bark valued at £912 was exported from Van Diemen's Land in 1848. The imports of mimosa bark have only been to a limited extent within the last few years, reaching 350 tons in 1850, against 110 tons in 1849, 230 tons in 1848, and 600 tons in 1847. The prices realized were £10 to £11 for chopped, £12 to £12 10s. for ground, and £8 to £9 per ton for unchopped bark. Whilst the imports were 3,900 tons in 1844, they dwindled to less than 400 tons in 1850." (Simmonds' "Commercial Products of the Vegetable Kingdom," 1854.)

In the instructions given (1821) by the Admiralty to Sir James Ross, when proceeding on his Antarctic expedition, his attention was particularly drawn to the astringent substances adapted for tanning, and to the various extracts of bark, &c., imported into England from the Australian Colonies, and which are employed by the tanner.

The quotations I have made have not historical interest merely; they show how, in time past as well as now, distant countries have been only too glad to get our wattle bark, but local requirements must first be met, and since we have abundance of hides, the value of an abundant supply of wattle bark to the Australian Colonies can scarcely be overrated.

PART I.

The Soil.

(*a.*) GENERAL CONSIDERATIONS.

No one who has troubled to make the observation can fail to notice how wattles frequently flourish naturally on the poorest soil, and thus it is that land can be utilized in this industry when it can scarcely be put under any other cultivation, and where not even grass grows. At the same time, bark richer in tannic acid and maturing earlier, may be obtained from trees growing on richer soil.

"The bark obtained from trees growing on limestone* formations is greatly inferior in tannin to that of trees grown on any other formation." ("Report of Wattle Bark Board," Melbourne, 1878.) Few observations of this kind have been made, and more are required; nevertheless, I do not hesitate to recommend farmers to utilize *any* poor land that they may have for wattle culture.

"Sandy soil is best, lying upon a clay subsoil. . . . I do not think that taking a crop of wattles off land renders it useless for other crops; but I consider it an advantage rather than otherwise, from the deposit of leaves, which manures the land for other crops. There is nothing to prevent one crop of wattles following another immediately; you may take three or four off without interfering with the productiveness of the soil." (J. E. Brown.)

As regards the Southern Coast districts of New South Wales generally, it does not appear that wattles grow more plentifully or more luxuriantly on one geological formation than another. It may be that wattles do not grow so densely on the rich chocolate soil as on poorer ground, but this may be owing to the fact that bush fires do not occur so often on such ground as in the more open localities of usually poorer soil.

Following is a communication kindly made to me by Mr. Alfred Cadell, of Vegetable Creek, N.S.W., in regard to the geological formations on which wattles flourish, or the reverse:—"I noticed that no bush wattle (or scarcely

* "Nevertheless wattles grow exceedingly well on limestone country in South Australia." (F. Wurm, in *Journ. Bureau Agric. S.A.*, April, 1890.) See also some of my analyses of barks grown on limestone country.

any) grows on the slate formation on the Grafton-Dundee Road, but seems to thrive on the granite country, or near the junction of granite and slate, where the metamorphic rocks occur. The land where the porphyry and altered slates are found in juxtaposition seems to be the favourite locality for the bush wattles."

(*b.*) PREPARATION OF THE LAND.

In preparing the land, if it be virgin soil, unencumbered with scrub, and of a light nature, breaking up of the surface, sowing the seeds, and harrowing is all that is necessary. If the land be covered with scrub or other vegetation these should be cut down, burnt, and the land prepared in the usual way.

Mr. A. L. Thrupp, of Woodside, South Australia, is, in timbered country, opposed to the felling of the timber (non-wattle), as he is of opinion that the trees, if ringed, form, even in their dead state, a protection of no mean value against frost and high winds for the young wattle plants.

It must not be understood that any careless kind of cultivation will do for wattles, although when once started they will thrive with scarcely any attention, but, like other crops, *the better the system of cultivation adopted the better the yield, and therefore the greater the profit.*

Land should, if possible, be ploughed all over, and not merely have drills run out. The increased expense of the former method will be found to be many times recouped. It is usually sufficient to plough the land to a depth of 4 or 5 inches; 6 inches is better still, and may be considered the standard depth.

Mr. Alfred Cadell, who has devoted much attention to wattle cultivation, and has induced others to do so, even manured a portion of ground for a patch of wattles, and the increased growth which has resulted has given him much satisfaction. Of course, whether manuring (and in what quantity) will pay in a particular instance must largely depend on local considerations.

(*c.*) MOISTURE.

Wattles like a moderate amount of moisture, say from 18 to 20 inches. (F. Abbott.) *Acacia decurrens* will, however, stand considerably more. Mr. J. E. Brown has grown wattles (*Acacia pycnantha*) successfully with 10 inches of rainfall, but ordinary cultivators will not usually succeed with less than 16 to 20 inches per annum.

On the other hand, it is not good for wattle trees to have an unlimited supply of water, as they then tend to throw out too much leaf, and the bark becomes flabby and deficient in tannic acid.

In speaking of wattles with respect to moisture, we must bear in mind that they may be divided into two groups—the dry-country wattles, liking warmth and not too high a rainfall, of which *Acacia pycnantha* may be taken as a type, and the coast wattles, of which *Acacia decurrens* may be taken as a type, which are capable of flourishing with a much lower temperature, and with a far higher rainfall.

The Seed.

(*a.*) COMMERCE IN WATTLE-SEED.

It goes without saying that in order to assist the development of wattle cultivation, it is necessary that there must be increased facilities in New South Wales for procuring seed. I have already alluded to the fact that it would be false economy to allow considerations of price to stand in the way of obtaining the best seed procurable from thoroughly healthy trees, for the ordinary cultivator only requires a pound or two, and the outside cost will only be a few shillings. Is the success of a plantation, perhaps involving an interest of hundreds of pounds, to be jeopardised through haggling with a seedsman over a few paltry shillings?

At present, of course, our seedsmen must obtain their supply of *Acacia pycnantha* seed from South Australia, while *decurrens* seed, of excellent quality, may be obtained from within our own territory, as well as from Tasmania and Victoria. It will be to the interests of Sydney and other seedsmen to establish local agents willing to push wattle-seed in districts already found suitable, or supposed to be so, for any or all of the species recommended for cultivation; and I hope it is unnecessary to insist on the common-sense advice of noting approximately the localities from which seed is collected, in order to prevent it being sent to districts totally different in climatic conditions. The best wattles are found growing under a great variety of circumstances, so there is no necessity to handicap the cultivation by ignoring local conditions.

Too great care cannot be taken to see that the seed-collectors do not mix silver wattle seed (*dealbata*) with *decurrens*. I have received complaints from New Zealand, and nearly every one of the Australian Colonies, of mixed seed being supplied to planters.

Mr. G. S. Perrin, Conservator of Forests of Victoria, informs me that the best Tasmanian *decurrens* seed comes from the east coast of Tasmania, Spring Bay, and Swansea; the best Victorian comes from the Portland district; the best New South Wales from the Eden district. At the same time, there are considerable areas in all three Colonies which produce fine trees and excellent seed.

(*b.*) QUANTITY OF SEED REQUIRED TO THE ACRE.

I have been often asked, "How much wattle seed is required to the acre?" and the question seems simple enough, but it is hardly as easy to give a precise answer. We have three sets of circumstances to consider:—

1. The kind of wattle seed used, whether a large sort (*e.g.*, *pycnantha*), or a smaller one (*e.g.*, *decurrens*), and it must also be borne in mind that seed of the same species may vary considerably in size. Following are some careful determinations of authentic seeds:—

pycnantha, 23,800 seeds to the pound.

decurrens (normal variety from about 50 miles south of Sydney), 28,500 seeds to the pound.

decurrens (*mollis* variety, from the celebrated Portland district of Victoria), 36,200 seeds to the pound.

decurrens (*mollis* variety, Tasmanian commercial sample), 38,300 seeds to the pound.

2. Whether broad-cast sowing, or the bamboo method of planting, be adopted.—If the latter method, one has simply to compute the number of trees required to the acre, and knowing the number of seeds to the pound, we have the necessary data for calculating the quantity of seed to be purchased. It will be remembered that two seeds must be planted in each bamboo in case of accident. In broadcast sowing, Mr. Brown calculates (*see* page 22) 30 lb. of *pycnantha* seed to 100 acres, say $\frac{1}{3}$-lb. seed to the acre. Mr. Perrin calculates 1 lb. seed to the acre. These are but estimates, and a margin must be allowed, for one cannot say more than that the quantity required will be from $\frac{1}{3}$ to 1 lb. per acre. It largely depends on the care of the sower, but the latter quantity must never be exceeded. In the bamboo method, practically every seed germinates, and none of the plants have to be wasted in thinning, as is the case in broadcast sowing.

3. The kind of wattle grown, and the distance apart of the trees.—According to the kind of wattle, whether a large sort (*e.g.*, *decurrens*), or a small one (*e.g.*, *pycnantha*), they will require to be planted at different distances apart, viz., about 10 feet *decurrens*, and 3 to 6 feet *pycnantha*.

Now the number of trees to the acre planted,—

3 feet apart is	...	...	...	...	4,840
4 „ „	...	...	...	...	2,722
5 „ „	...	...	...	...	1,742
6 „ „	...	...	...	...	1,201
10 „ „	...	...	...	...	435

(*c.*) PREPARATION OF SEED FOR GERMINATION.

The outer covering of the seed is of great hardness, and under ordinary circumstances it will remain in the ground for many years before germination.

I am indebted to Mr. William Neilley, of Sydney, for what appears to be a well-authenticated instance of wattle seed remaining dormant in the ground for over thirty-seven years. An allotment of land in the town of Bega, purchased from Mr. Spence, formerly had wattles on it, but the trees and all wattles near had long since been destroyed. After a lapse of thirty-seven years Mr. Neilly had the land ploughed, and wattles sprang up thickly when the ground was trenched.

Bush-fires, however, usually hasten matters, and it is well known that perfect forests of young wattles spring up in many places after these occurrences. The operations of nature are therefore assisted in practice by means of heat, and this heat may be either dry or moist. For the first, Mr. J. E. Brown recommends a quantity of brushwood to be burnt to the condition of expiring embers. "In this residuum of the fire the seed is placed, and mixed up with the ashes and charred coals, and the whole is then allowed to remain until cooled down. The seed is now ready for sowing. If the intention be to sow it singly, by dibbling or in some other way, it will have to be cleaned and separated from the residue of the fire by riddling, or by the aid of an ordinary grain-winnower. If, however, the seed is to be sown broadcast, it will be sufficient if the embers are raked off the heap, and the remainder, containing both ash and seed, stored ready for sowing. The advantage claimed for this method of preparation is that the seed can be sown either broadcast upon the ground without covering, or dibbled in the soil in the ordinary way, at any season of the year, and especially before the winter rains set in." Care will, of course, require to be exercised to prevent loss by over-burning. A fryingpan is used by some people for roasting wattle seeds, and the danger of over-heating will be minimised if a little water be put into the fryingpan.

Secondly, the method of treatment by boiling, or hot water. Mr. Brown has recommended that the seed be placed in a vessel, water *almost boiling* poured upon it, and left to soak for one or two days; the seed is then taken out and kept damp in a bag until swelling takes place. "The only drawback to this system is that, when sown, the seed must of necessity be covered with soil, and that the operation be carried out in the winter season only. Unless the seed be covered as it is put out, so as to keep up the necessary supply of moisture to complete germination, a change of dry weather would undoubtedly result in its entire loss." Nevertheless, this is the method which Mr. Brown recommends growers, especially beginners, to adopt.

Professor Tate, who, in addition to his scientific knowledge, has had much practical experience in wattle-planting, has instituted a series of experiments upon the temperature to which wattle seed may be exposed in assisting it to germinate. The experiments are useful, in that they enable the operation of treatment with hot water to be conducted with greater confidence. In my own case I have been afraid to destroy the vitality of seed by the application of too high a temperature; but Professor Tate shows that the seeds may be *boiled* for several minutes without injury, though there is no advantage in heating the water above 150° F. I quote his important experiments from Mr. Brown's Report:—

Experiment 1. *Acacia pycnantha.*—Equal parcels of seeds saturated with water at the following degrees of temperature:—

150°, 170°, 190°, 200°, 212° — The seeds germinated in about equal proportions at the end of three weeks.

Experiment 2. *Acacia decurrens.*—Seed saturated with boiling water, and kept in wet sand in a warm place, germinated at the end of two weeks.

Experiment 3. *Acacia saligna.*—Seed saturated with water at 212°, July 22nd; seeds began to burst, July 29th.

Experiment 4. *Acacia pycnantha*—

July 22nd, boiled for 1 minute.
" " 3 minutes.
" " 5 "
" " 7 " — All the seeds germinated August 9th.

(*d.*) THE BAMBOO METHOD OF PLANTING.

Mr. J. E. Brown advocates the raising of wattles in bamboos. The raising of trees by this means is so common in India, has been so successfully carried out in South Australia* by Mr. Brown, and is withal so simple, that I give a brief account of the method here, compiled from that gentleman's evidence before the Victorian Royal Commission on Vegetable Products, and published in the Fourth Progress Report.

In India the true bamboo is used because it is abundant. In South Australia a large South European reed† (*Arundo Donax*, Linn.), which locally bears the name of "bamboo," is used instead. The reed is cut to 4 inches in length, by means of a small circular saw driven by hand or water-power. Endeavours are made not to include joints in the pieces cut, but if one should occur it is bored through. The pieces are packed together upright, filled with soil, the seed put in and allowed to remain there till the

* It has also been tried to a limited extent in New South Wales.

† Sometimes known as the Danubian reed.

planting season. The seedling is transplanted in the "bamboo" just as it stands, and in cases where the bamboo is not sufficiently rotted, they are split up, in order to allow the roots to expand. Hundreds of trees thus start their careers, and can be transported in one small box—a brandy case for instance.

A full description of the bamboo method (with diagrams) will be found in Brown's *Tree Culture in South Australia.*

Following is a more detailed account of the way to prepare and fill the bamboo tubes, taken from a report to the Agricultural Bureau of South Australia, by Mr. A. Niemann, of the Forest Department of the same Colony:—

"The tubes, which should be from 4 inches to 6 inches long, are cut on a bench made as follows:—Take a piece of deal or hardwood about 4 feet long, 9 inches broad, and 1½ inches thick. From the right-hand corner of this, saw out a piece the length the tubes are required and about 2 inches deep. On the same end from which the piece has been cut, nail or screw on a piece of 1 inch deal, the end of which piece should stand out flush with the edge of the bench, and about ¾ of an inch above the level of the top. Along the bench fasten a cleat 1 inch in thickness and 2 inches broad, standing in about 1½ inches from the back edge of the bench. Fix the whole to a stand about 18 or 20 inches high, and the bench is complete (of course the cleated side of the bench being the top.) For cutting the tubes, a 16-inch tenon saw is used—sharp, but not too coarsely set. The operator takes the bamboo, pushes it tight against the piece of deal nailed on to the end of the bench which forms a stopper, and holding it firmly against the cleat with the left hand cuts off the tube with one downward stroke of the saw, the guide for length being the inside edge of the piece as described. With this guide there should be no trouble in keeping the tubes of uniform length, which they should be, a lot of time and trouble being thereby avoided when placing for filling and sowing. Where a plentiful supply of bamboo is available, all the knots should be cut out and only the clear tubes used. If the knotted pieces have to be used, they can be bored clear with a long thin-bladed knife. The tubes being cut, the next operation is to place them in position for filling and sowing. A bed suitable for this purpose can be made of clay, well beaten or rolled level, smooth, and hard, and enclosed in an edging of paling or any other available material, which, if possible, should be the same height as the tubes. Into this bed the tubes are packed as closely as possible on end, the bed being any length, but not more than 4 feet wide. The tubes are then filled with soil, which should be of a light sandy nature (but not pure sand), perfectly dry, and passed through a very fine "riddle" to take out all the

lumps, &c., which are apt to stick in the tubes and prevent them from being properly filled. The soil is then thrown into the bed and scraped backwards and forwards with a piece of board, used edgewise, until all the tubes are filled, when the whole should be well watered and allowed to stand for about an hour. Then throw on more soil and sweep the bed well with a stiff stable broom, thus leaving each tube clearly defined. Drop into each tube two seeds—the seed having been previously prepared by soaking and sweating. The bed is then covered with a mixture of two parts soil and one part well-rotted stable manure or wood-heap refuse. The cost of cutting, filling, and sowing 500 tubes amounted to 2s. 6d., the work being performed by one of the cadets on this reserve, a youth who had no previous experience in this work, and was further handicapped by having to use a very bad saw; so that I do not think it would be an under-estimation to put down the cost at 5s. per 1,000. The most advisable time to sow would be February, planting out about July or August if the season were a late one."

A wattle-planter in New South Wales substitutes little twists of brown paper for the "bamboos," and doubtless other simple expedients are in use. The brown paper is rolled round a stick, screwed at the bottom, filled with earth, and the seeds planted therein. The paper attracts water to the soil during the dry season, and prevents too much water getting at it during the rainy season. As the industry gets established on a firmer footing, "bamboos" will be available (they grow like weeds in damp localities not too cold); meantime, any ingenious man can get over the lack of them.

(*e.*) BROADCAST SOWING.

Mr. G. S. Perrin, State Conservator of Forests, Victoria, recommends half a bushel of sand to be mixed with each pound of seed sown, and after treating the seed with hot water, as before described, to broadcast thoroughly, as in sowing wheat. He justly remarks that, if done with discretion, much after-labour will be saved in the thinning process.

Mr. F. Abbott recommends that the seed be soaked and simply sown broadcast on ploughed ground.

In soaking seed (as directed) for sowing, sufficient only should be prepared for one day's sowing at a time. Where seed has been soaked and sown, it must be covered immediately with soil, say by means of light harrows.

In planting with wattles that wretched desert country near the Melbourne-Adelaide Railway, from Bordertown to Murray Bridge (hitherto considered useless for any purpose), Mr. J. E. Brown, in giving evidence before the abovementioned Commission, stated his intention simply to roll the scrub

down, scatter the seed, and then set fire to the scrub. This rolling is effected by making a team of bullocks draw an old boiler; the larger saplings are previously cut with an axe.

"Five years ago I put in 50 acres of wattles in a very sandy portion of Mount Burr Forest, and next year I intend stripping it, and I have no doubt I shall receive 5 tons per acre from it. The country is very sandy—almost pure sand—the seed was sown broadcast, a flock of sheep run over it to trample it in, and the crop was so thick that we have had to thin it twice."—(J. E. Brown.) Mr. Brown informs me that the first thinning gave 1 ton of bark per acre, and there then remained about 1,200 trees per acre. Calculating the small average of 10 lb. of bark to each tree, this would give a further amount of 5½ tons of bark, and thus the original estimate (made in 1888) was more than realised.

Seed is preferably sown immediately the winter season has set in.

"Mr. F. Krichauff, of South Australia, caused wattle seeds to be sown upon some sandy land in the Bugle Ranges during May and August. Those sown in August made much greater progress than those sown in May. The seeds were sown upon a young barley crop, and then trodden in by sheep." —(*Journal of S. A. Bureau of Agriculture*, Nov., 1889.)

Addendum.

Following are extracts from a leaflet, giving a few simple directions in regard to wattle cultivation, which has been issued by the Superintendent of Technical Education, under the direction of the Minister of Public Instruction. Some of the points have already been touched upon :—

"*Nursery.*—If there be only a small area to be planted with wattles it is best to raise seedlings in a nursery. Whilst young they can be easier looked after and protected. Wattles will not stand transplanting at every season of the year with any degree of success; therefore they should be planted in small flower-pots or bamboos, in which they can be readily taken to the open ground. If grown in flower-pots, three or four seeds in each will be sufficient. When the plants are up, weed out all but the strongest one. After they are a few weeks old the pots will be found to be full of root; they should then be removed to their permanent home. To take them out of the pots turn them upside down, and by placing a finger in the drainage hole at the bottom of the pot the plant with its roots can be easily taken out, and will suffer nothing by removal. In the State Nursery at Gosford the seeds are sown in boxes containing peaty loam, mixed with clean sharp sand, the soil being kept always moist. When the seedlings are sufficiently established they are transferred to the open ground.

"*To sow broadcast or in drills.*—If the seeds have been assisted in their germination by means of hot ashes, rake or sift out the larger coals and sow the ashes with the seeds. If the germination has been commenced by the hot water process, mix the seed thoroughly with dry ashes or sand—this will prevent the seeds from sticking together—then sow broadcast or in drills in the usual way. If the seeds are to be dibbled they must be freed from the ashes. Whichever method be adopted for sowing, the seed should be well covered, and in the case of those that have been soaked in water this is essential, for a few hot and dry days would effectually check all further growth. Three or four seeds at about *three feet** apart is the distance required; this will allow for thinning.

"Do not cover the seeds too deeply; about an inch underground will be ample.

"Sow sparingly; this will save a lot of thinning afterwards."

The Tree and its Bark.

(*a.*) PRUNING AND THINNING.

Wattle-trees are sometimes recommended to be pruned. "The advantages of this are larger dimensions of individual trees, and hence more bark in proportion; cleaner stems, easier stripping at less expense, less liability to disease, and quicker returns, because the tree will arrive at the stripping stage sooner by having its vitality confined chiefly to the stem. The best period for pruning is during the months from January to March." (J. E. Brown). Mr. A. L. Thrupp, however, deprecates pruning in warm northern exposures, as too much sun would be admitted to the stem of the tree.

If wattles be not planted too far apart, nature does her own pruning of the lower branches. In a plantation of *Acacia decurrens*, for instance, the trees obstruct the light from each other, inanition of the lateral branches takes place, which wither and fall off, and thus a long clean stem is produced, from which the bark can be readily stripped.

Mr. F. Abbott recommends that wattle seedlings be thinned out, as soon as they are big enough to handle, to 10 feet apart.† This is perhaps a fair distance, but authorities do not agree as to the precise distance. It rather

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* *Acacia pycnantha* is here alluded to. They will thin out to 4 or 6 ft. apart. Cf. p. 22.

† This advice refers to rather large trees, such as *decurrens*, and not to small wattles, such as *pycnantha*. Cf. page 55.

resolves itself into a matter of common sense, for one must, on the one hand, avoid having wattles too close to each other, otherwise "leggy" trees are the result; and, on the other hand, trees too bushy are not desirable.

Wattle-trees should be transplanted with a moderate amount of care, as they are not the hardiest of plants to stand moving.

(*b.*) TIME OF YEAR FOR STRIPPING.

Wattle-barks are often gathered all the year round, whereas they should only be stripped for three or four months in the year (the months usually recommended being September, October, November, and December)*; out of that season there is usually a depreciation of tannin in the bark. In these months, also, the sap usually rises without intermission, and the bark is easily removed from the tree. The impression appears to have prevailed amongst bark-strippers that whenever the bark would strip it possessed full tanning properties, but this is erroneous. After a few days of rain during other seasons of the year, a temporary flow of sap will cause the bark to be easily detached from the trunk, but then it is greatly inferior in quality. (*Report Victorian Board*).

(*c.*) HOW TO STRIP.

A cut in the bark should be made about 3 or 4 feet from the ground, and a sheet pulled off *downwards*. In this way bark is saved, even to that which is found on the large roots, and bark stripped close to the ground is usually the thickest and richest in tannic acid. It is well known that strippers often neglect the bark to which allusion has just been made.

Some people fell their wattles before stripping, and use the wood for fire-wood. Bark-strippers as a rule leave about a third of the bark on the tree, besides leaving unsightly dead trees. It should also be borne in mind that dead and decaying trees are a source of danger to the plantation, owing to the harbour they give to insect pests. The matter of utilising the bark on the twigs, &c., will be alluded to under "Extracts."

(*d.*) AGE AND SIZE OF TREES.

Wattle bark should only be procured from mature trees, *i.e.*, from those whose bark possesses the full natural strength. The Victorian Board states, as has already been noted, that bark-stripping (*decurrens*) may profitably commence at the end of the fifth year, and returns undoubtedly commence

* No fixed time, applicable to all parts of New South Wales and to varying seasons, can be given. Farmers and others will have to find the best time from their own experience, supplemented, of course, by assays of bark stripped at various periods.

not later than this period. Mr. J. E. Brown strips his wattles (*pycnantha*) at about 6 years of age, but the exact period can only be decided by the cultivator's common sense. Mr. A. Bucknall mentions that wattle trees mature in seven years in the Majorca plantation, Ballarat. Mr. W. Ferguson, of Victoria, makes the general statement that none (*decurrens*) should be cut under 5 inches in diameter—a reasonable suggestion which might be enforced, on Crown lands, by legislative enactment.

Mr. Thrupp states, as his experience, that greater weight of bark can be produced in five years when cultivated, as against 8-year-old bark grown in its natural state (*Journ. S. A. Bureau Agric.*, April, 1890). It is to be hoped that farmers and others will institute some experiments with the view to estimate the improvement in quantity and quality of wattle bark under cultivation, but such experiments, to be conclusive, must have the data carefully checked, in order to make sure that the comparisons of wild and cultivated trees are as fair as possible.

(*e.*) TO INCREASE BULK OF BARK.

Mr. Thrupp states that if the bark of a wattle tree of three or four years be slit down on the south side with a sharp knife, from foot to first branch, the increase in the bulk of the bark will be considerable. This has been tried in the Montacute District of South Australia successfully for years. Spring is the proper time for this work. (*Journal S. A. Bureau of Agriculture*, November, 1889.) A correspondent of mine, engaged in wattle cultivation in the Blue Mountains, has also practised this method with success. He has instituted comparative experiments, and is convinced of the advantage of the process in increasing bulk of bark. He performs the operation in the early winter (May or June).

(*f.*) FIBRE IN BARKS.

The best wattle barks contain comparatively little fibre. A good bark will, as a rule, grind to a fine powder, while one which with the same treatment forms a fibrous substance is, as a rule, to be avoided. I have not, however, come to any conclusion with respect to the connection between percentage of tannic acid and fibre. The practical disadvantages of a too fibrous bark are twofold; firstly, it cannot easily be disintegrated (this may perhaps be got over by substituting cutters for crushers); secondly, a disintegrated fibrous bark may be so bulky that sufficient cannot be got into the pits to tan the leather, and when it is exhausted it is difficult to remove. This difficulty need not be insurmountable, but in a few years it is to be hoped that the supply of little-fibrous bark will be adequate.

(*g.*) DRYING OF BARK.

Mr. A. L. Thrupp, in a paper read in March, 1890, before the Congress of Agricultural Bureaux in Adelaide, carefully warns tanners and others against receiving wattle-bark damp, pointing out that bark in that state engenders mould "of a most virulent form," is liable to spontaneous combustion, if stacked in the hold of a vessel, and, while bark received green will tan hides as fast as bark received dry, still, there is the undeniable fact, in nine cases out of ten, that leather produced from bark so received, so stacked, and used for tanning purposes is spotted, and therefore of second rate or third rate value.

Apart from the intermittent supply already alluded to, it is owing to the greedy and indiscriminating way in which wattle-bark has been gathered, and the moist condition in which it has often been shipped, that purchasers in England, finding the quality variable, have not entered into its regular employment as largely as might have been expected.

Too much attention to this question of drying cannot be given. I have seen excellent bark sent to market in a mouldy condition, and sold for next to nothing. Bark must be dried *on the spot.* This is usually carried out in a large weather-shed, and the operation takes several weeks, the precise time being of course dependent on climatic circumstances. It is usually laid on saplings, the sap side downwards. Where an engine is used at the stripping depôt, common sense will dictate some method of utilizing the waste-heat to dry the air in the shed, but bark must not be subjected to a high temperature, otherwise diminution in tanning-power will take place.

(*h.*) GRADING OF BARK.

The physical characteristics of barks require to be taken into consideration as well as percentages of tannic acid, and consignments should be as nearly uniform as possible. Bark should be classified or graded just as wool, fruit, &c. No care spent in this direction will be unrewarded, and no kind of raw product has suffered more from slap-dash, empirical judging, than wattle bark.

Special brands of bark well known to buyers sell readily, so it is advisable to endeavour to cultivate their good opinion by sparing no pains to keep bark up to a standard quality, and by using a particular brand or trade-mark.

In the present rule of thumb method of dealing with consignments of wattle-barks, localities have much to do with the price obtained; while bark from localities bearing a good reputation finds ready sale, new localities have

a prejudice to contend against. Thus, speaking of New South Wales bark at the Sydney sales, that from Braidwood and Bega sells readily, while southern bark is greatly preferred to northern. Now these distinctions are based upon the solid rock of mature experience, but it is an undoubted fact that they are sometimes pushed too far. Wool is judged critically ; the time will come when bark will be judged as critically—on its merits—with the advancement of technical education.

(*i.*) EXPORT, PACKING, &c.

In regard to the preparation of bark for export, the following letter from a well-known London firm of brokers, which appeared in the *Leather Trades' Circular and Review* of the 8th March, 1887, is valuable:—

"In reply to a question as to the best form in which to ship mimosa (wattle) bark, we beg to state that the trade, as a rule, prefer it ground, so long as they can be sure it is not adulterated. Some few, however, cannot be satisfied unless they grind it themselves. We should recommend shipments of well ground, with a few parcels chopped or crushed in *bags*, but as we know that freight is heavier on the latter, and buyers expect a reduction of from 10s. to 20s. per ton to cover cost of grinding, the former will generally be most satisfactory to shippers. We think that the strength is better preserved in the chopped than in the ground, but there is nothing we can suggest as an improvement on the best standard marks of Adelaide ground. If shipments of chopped be made, it should on no account be shot loose in the ship's hold."

Barks are sent into commerce in one or more of four forms:—

1. In the bundle.

"In this form its quality can be more readily judged; but when the supply of mature trees became diminished, nearly all the bark was chopped or ground prior to shipment, good and inferior being bagged together."

2. Chopped, *i.e.*, into pieces a few inches in length.

In the Sydney market bark is usually sold chopped, in bags.

3. Ground, forming a substance something like "tow"; and

4. Powdered, that is of course, if the bark is not too fibrous to permit of this being done. It is not desirable to push the process of grinding too far, as wattle-bark is no exception to the generality of powders, in forming "balls" when thrown into water when too finely ground.

(*k.*) ADULTERATIONS OR SUBSTITUTIONS.

Good wattle-bark is sometimes mixed with inferior, and this admixture may be either intentional or accidental. "Blue bush" bark (*Acacia brachybotrya*, page 45), for instance, is sometimes chopped up to adulterate *pycnantha* bark. Silver wattle bark (*dealbata*) is occasionally so like green or black wattle bark (*decurrens*), that it would deceive an expert, particularly if chopped, and while the two barks can be instantly separated, as a rule, I can readily understand some specimens of silver wattle bark inadvertently mixed with bark of better quality, and passing muster. The subject is a wide one, and these few notes are simply intended to warn the unwary.

Profits and Loss and Minor Industries.

PROFITS TO BE DERIVED FROM WATTLE CULTIVATION.

Wattle cultivation is in its infancy, and, as far as I know, no wattle-grower has favoured the world with a peep at the item "Wattle Cultivation" in his ledger. We are, therefore, chiefly dependent on estimates in lieu of statements of results attained, but those which follow are as trustworthy as can be supplied. Wattle conservation and cultivation have been little taken up in our own Colony, but we are already taking steps to remedy this.

Following are the opinions of gentlemen in the several colonies on the prospect of profit in wattle-planting. They are culled from the reports of the Victorian Royal Commission on Vegetable Products:—

New South Wales.—Mr. Charles Moore, F.L.S., Director of the Botanic Gardens, Sydney,—"They are a very profitable crop indeed."

Tasmania.—Mr. F. Abbott, Curator of the Botanic Gardens, Hobart,—"I have not the shadow of a doubt that they are a valuable crop to any farmer; they come on in a very short period, and there is always a revenue from them."

South Australia.—Mr. J. E. Brown, F.L.S., when Conservator of Forests, Adelaide,—"With regard, however, to the wattles, there can be but one opinion as to their cultivation being the means of a large and most valuable source of revenue both to individuals and to the State."

Victoria.—Mr. I. Hallenstein, tanner, currier, and leather merchant, Melbourne,—"I do not think a farmer or anyone with the means could produce any crop more valuable than the wattle bark. We have got faith in it, or we would not have gone to the expense of putting 800 or 1,000 acres under cultivation."

The following evidence was given by Mr. W. Ferguson, Inspector of State Forests, Victoria:—

"I calculated that from the time the seed was sown at the Majorca plantations, Ballarat, in seven years we should get about 10 tons to the acre of bark. That is, off the trees that were fit for barking at that time, and at the rate—of the present rate of bark—it varies from £8 to £10 per ton.

"You would get 10 tons to the acre? Yes.

"From trees that have been how many years growing? Seven years.

"That would average £10 a ton? Yes, at the present,—and it is likely to be more.

"That is, £90 per acre? Yes.

"That will be about £13 per acre per annum? Yes.

"Would that take all the trees, or leave a portion remaining? No, only the first thinning out.

"How many thinnings would that plantation admit of year after year? For years and years to come, because you will find them in all stages of growth. But I calculated that from the first thinning out.

"And would that yield as much each succeeding year? It would yield as much each succeeding year.

"So that you might get 10 tons per acre in each succeeding year? Annually for years to come, if they are judiciously thinned, but not as they are thinning (destroying) them in the forest. If they are properly cultivated—cultivated for profit.

"Can you mention any other crop grown in Victoria more profitable than that? No; and it is grown on such poor land, where neither grass nor anything will grow. In Rodney, where I mention, there is not a bit of grass to be seen, and there the wattles come up thick."

At the sewage farm at Islington, near Adelaide, Mr. J. E. Brown planted 40 acres in wattles. "The seed was simply soaked in hot water and broadcasted, and the soil afterwards harrowed with a brush harrow; altogether, the whole expense of seed, preparation of the ground, and putting the seed in cost about £15. Four years afterwards the wattles were simply thinned, and the bark of the thinnings realised £25, thus more than refunding the

original outlay. Next year I hope the thinning will realise something like £3 per acre. In three years time from this (1888) we purpose stripping the whole crop, when I am certain it will realise at least £50 per acre." Mr. Brown informs me that the second *thinning* alone, made in 1889, realised £200, equal, of course, to £5 per acre.

Detailed Estimates.

1. The following statement showing the profit to be derived from the systematic cultivation of wattles, was compiled from the evidence given before the Board of Inquiry on Wattle Cultivation, Melbourne, 1878, and forms an appendix to their report. (The Board recommended *A. decurrens* and *A. pycnantha.*)

Receipts derivable from a Wattle Plantation of say 100 *acres, planted in the manner proposed.*

Each acre planted with wattles* 10 feet apart, would carry 400 trees; at the end of fifth year, trees would yield say 56 lb. matured bark; stripping only every third tree 333 tons would be obtained off 100 acres; this, at £4 per ton, would give at first stripping	£1,332 0 0
In the sixth (or following) year, a similar number of trees would be stripped, the bark having increased in weight say 14 lb., the increased yield of second stripping would therefore be 400 tons at £4, making	1,600 0 0
In the seventh year the remaining trees would be stripped, from which a still greater increase would be obtained, say 480 tons at £4, making	1,920 0 0
The aggregate yield of bark during the first eight years, 1,215 tons, amounting in value to.....	£4,852 0 0

Estimate of Expenditure on a Wattle Plantation of 100 *acres during eight years.*

Rent of 100 acres for eight years, at 6s. per acre per annum	£240 0 0	
Ploughing 100 acres in drills 10 feet apart	25 0 0	
Sowing wattles and actual cultivation, including cost of seed	37 10 0	
Supervision for eight years, say, £10 per annum	80 0 0	
Pruning the trees, taking off useless wood, &c. (only necessary for two years), 10s. per acre	50 0 0	
Incidental and unforeseen expenses.....	27 10 0	
Interest on the whole amount expended during eight years	240 0 0	
		700 0 0
† Actual cost of stripping and carting, as shown below ...	£1,515 0 0	
		1,515 0 0
‡Profit balance, exclusive of improvements or supplementary sowings.....	£2,637 0 0	
		2,637 0 0
		£4,852 0 0

* This estimate is evidently based on the assumption that *decurrens* is the Wattle selected.

† The cost of stripping would not exceed 15s. per ton. on account of the facilities presented by the regularity of the trees, while carting would represent another 10s. per ton. These combined charges would be 25s. per ton, and on 1,215 tons would be £1,515, leaving a clear profit on 100 acres (after allowing for primary expenditure) of £2,637.

‡ In addition to the bark taken off the land, a fresh supply would be available in two years afterwards, as the Board recommend that every tree stripped should be replaced by another sowing. All improvement effected may be calculated as additional profit.

2. The following estimate is by Mr. J. E. Brown, and is taken from a report by that gentleman to the South Australian Legislative Council in 1884. (Mr. Brown recommends *A. pycnantha*) :—

Revenue.	£	s.	d.	Expenditure.	£	s.	d.
To value of property increased and improvements say ...	400	0	0	By purchase of 100 acres, at £3 per acre	300	0	0
„ value of 500 tons of bark, at £5 per ton	2,500	0	0	„ cost of substantial fence all round, say, 1½ miles at £50 per mile	75	0	0
				„ ploughing 100 acres, at 8s. per acre	40	0	0
				„ of 30 lbs of seed, at 1s. per lb.....	1	10	0
				„ labour, sowing the seed in rows, say, at 5s. per acre.	25	0	0
				„ scarifying between the rows twice, at 4s. per acre.....	20	0	0
				„ thinning and pruning for two years, at 10s. per acre per annum	100	0	0
				„ forming fire-breaks during the third to seventh year, say, £5 per annum	25	0	0
				„ sundries	50	0	0
				„ interest on money expended during the seven years, say	280	0	0
				„ cost of stripping 500 tons of bark, at 25s. per ton...	625	0	0
				„ cost of carting same to market, at 10s. per ton...	250	0	0
				Balance, being clear profit ...	1,108	0	0
£	2,900	0	0	£	2,900	0	0

Notes on above Estimate.—At the distances apart which I recommend the trees to be grown, namely, 4 to 6 feet, there will be an average of 1,200 trees to the acre. In order, however, to make due allowance for blanks, I base my calculations upon there being 1,000 only to each acre. £5 per ton is only two-thirds of the present selling price of bark. I give 5 tons as the probable yield per acre. That this is a low estimate will be admitted, when it is considered that this only allows for 10 lb. of bark to be taken from each tree. (J. E. Brown.)

3. Estimate of expenditure upon, and revenue from, a wattle plantation of 100 acres, during a term of seven years, by Mr. G. Perrin, Conservator of State Forests, Victoria, 1889.

He recommends cultivation of the broad-leaf wattle (*A. pycnantha*); broadcast sowing.

Expenditure.	£	s.	d.
To rent of land at 4d. per acre, under Wattle Cultivation Bill, at £1 13s. 4d.	11	13	4
To fencing, say, 1 mile and 3 quarters, at £40 per mile	70	0	0
To ploughing (and harrowing twice), at 14s. per acre	79	0	0
To purchase of seed, 1 lb. per acre, 100 lb., at 1s.	5	0	0
To ploughing and burning off fire-breaks, four blocks of 20 acres each, with 20 feet roadway between each block, three furrows on each side, at £10 per annum	70	0	0
To vermin destruction, and unforeseen expenses, say	50	0	0
To first pruning and thinning at end of second year after sowing, say 10s. per acre	50	0	0
To final pruning about fourth year (superficial only), at 5s. per acre	25	0	0
To interest on seven years' rental £3 15 0			
To interest on expenditure, say 206 10 0			
	210	5	0
To stripping 100 acres of wattles (1,200 trees to the acre), producing 12 lb. of bark per tree, or 602 tons in all, at 25s. per ton	807	10	0
To cartage to a railway station, say 5s. per ton	165	10	0
	£1,534	18	4
Receipts.			
By 100 acres of wattle-bark from 1,200 trees to the acre, each producing 12 lb. of bark—642 tons, £7 10s. per ton	4,815	0	0
Less expenditure	1,534	18	4
Profit	£3,281	18	4

Table to aid in the comparison of the more important items contained in the three foregoing estimates.

A.—Out-goings.

	Victorian Board.	Mr. Brown.	Mr. Perrin.
Cost of land per acre	.....	£3	.....
Rent per acre per annum	6/-	.....	4d. under Wattle Cultivation Bill.
Fencing, per mile	.....	£50	£40
Ploughing	£25	£40	£79 (includes harrowing).
Scarifying, per acre	.....	4/-	.....
Fire breaks	.....	£25	£70 (fuller specification).
Seed and sowing	£37/10/-	£26/10/-	£5 (seed only).
Pruning, &c., per acre	10/-	10/-	10/-
Stripping, per ton	15/-	25/-	25/-
Carting, per ton	10/-	10/-	5/-
Supervision for eight years	£80	.....	.....
Interest on money	£240 (8 years)	£280 (7 years)	£210/5/- (7 years).
Contingencies	£27/10/-	£50	£50

B.—INCOME.

	Victorian Board (*decurrens*).	Mr. Brown (*pycnantha*).	Mr. Perrin (*pycnantha*).
Yield of 5th year trees, each	56 lb.	10 lb. from each tree, admittedly a low estimate.	12 lb.
,, 6th ,, ,, ...	70 lb.		
,, 7th ,, ,, ...	84 lb.*		
Value of bark, per ton.....	£4	£5	£7/10/-
Total yield in tons	1,215 (8 years)	500 (7 years)	642 (7 years).

* Every third tree stripped.

OBJECTIONS TO WATTLE-GROWING CONSIDERED.

I quote the following extract from a letter from a gentleman living in the Glen Innes district, who perused the first edition of this pamphlet. It is a thoughtful letter from one who has had some experience in the matter concerning which he writes. It places the difficulties (partly general, and partly founded on local considerations), in a clear light, and I will proceed to deal with them seriatim, for convenience. The subject of wattle-growing will bear calm discussion, for we have much to learn in regard to it yet:—

"There are two methods of planting suggested by this pamphlet. First, by careful cultivation, which would be costly, and second, by broad-cast sowing, without much expense.

"To adopt the former method here, I should say, would be to result in failure, as I should think the land is far too heavily timbered (1)* to allow of the ground being cleared and cultivated, and if merely sown broadcast, as by the second plan, I cannot see how the young trees could be protected from being destroyed by fire. (2) 'The author of the pamphlet suggests planting on the poorest soil' even where grass never grows (3), but my experience here is that even the poorest country, when fenced off from stock, and with the usual amount of rain, we get a great deal of undergrowth and coarse grass will grow, thus always being a source of danger to the young plantation, and leaving its fate to the tender mercy of the flames. I have tried a few seeds of the better kinds of wattle, amongst others *A. decurrens*, but could not get them to live through more than one or two winters (4), and I have noticed lately that a great number of wattle trees, known as "hickory," seem apparently killed, I presume by the frost.

"I will, however, plant the seeds you kindly sent (though I suppose the best results could not be expected, as the pamphlet recommends the beginning

* The objections which are numbered (1), (2), &c., are dealt with seriatim at the close of the letter.

of winter for sowing), and I will, in due time, let you know the result. I had, some three or four years ago, an idea of going in for wattle cultivation, and with that intention I fenced off a paddock of about 50 acres, but found the cost of clearing too great, so I let the matter drop; but I am still of opinion that there is some of the most suitable soil in the colony for wattles, if we only knew the right kind to go in for." (5).

1. This is a local consideration which will apply to preparing the land for *any* crop. A wattle crop is remunerative, but to what extent it can stand being debited with expensive clearing is a matter for decision in each separate case.

2. Wattles are protected from fire by fire-breaks, and also by removing inflammable rubbish from amongst them. At the same time, the finely divided foliage of *Acacia decurrens* makes it the most susceptible of the commercial wattles to destruction by fire. *Acacia pycnantha* and *A. penninervis* are much less liable to this danger.

3. This is a statement intended to indicate that a particular soil can be hardly too poor to grow wattles, and it may be taken literally also. The matter has been dealt with already, but I may quote the following extract from the evidence of the late Mr. W. Ferguson before the Victorian Royal Commission on Vegetable Products:—"Now I consider that any man who has a desert of poor land, which would not grow anything else—that would not grow cereals—could not put it in to anything better than a crop of wattles, if he attends to it properly." The Murray desert is a case in point.

Straggling grass is undoubtedly a danger to a wattle plantation, but it will always pay to keep it in check.

4. There are few districts in the Colony which are too cold for the growth of the best wattles. Having decided on the proper wattle, seed should be obtained from a district approximately similar in climatic conditions, and well matured.

5. I trust that this objection has now no weight in it.

EXTRACTS.

"The first shipment of tanning material was made from Sydney to England as far back as 1823, in the shape of an extract of the bark of two species of mimosa (*Acacia*), which was readily purchased by the tanners at the rate of £50 per ton. One ton of bark had produced 4 cwt. of extract of the consistency of tar."

Mr. H. Heaton (*Australian Dictionary of Dates*, p. 267), states that Mr. Thomas Kent "discovered* the virtues of Mimosa bark extract," and received as a reward 10,000 acres of the richest land he could find in Tasmania, 1829.

See also a paper "On the Export and Consumption of Wattle Bark, and the process of Tanning," by James Mitchell (*Proc. R.S. Van Diemen's Land*, 1851). The subject of extracts is here dealt with.

The preparation of extracts causes an immense saving in freight, but an extract is chiefly valuable in that it enables us to utilise everything. The following is an account of a process as carried on in South Australia at the present time, and is suggestive :—"Messrs. Barrow and Haycroft have established at Echunga a manufactory of tannage, which, from the methods employed, is almost pharmaceutical. About 10,000 tons of wattle bark are sent annually from South Australia alone, and it is calculated that the waste in stripping is about four times this amount. The new factory converts the branches, too small to pay for stripping, into a strong fluid extract called tannage, which contains water 60 per cent., and soluble tannin 38·2 per cent., according to an analysis by Mr. G. H. Hodgson of samples from the first 80 tons recently shipped to England. The wattle 'trash' yields 12 to 16 per cent. of tannage. Two men can often cut and load 5 tons, and the waggons can bring in two loads a day, equal to 5 or 6 tons ; and at the price (£1 a ton) which the firm is paying for thinnings and tops and branches, so much is offering that the patentees are obliged to distribute their order. The trash is tied up in large bundles and carted into the factory. It is there weighed, close beside the machine which cuts it up into 'chaff.' This machine is very much like an ordinary steam-plane, the chisels revolving at a high speed, and cutting through 2½-inch saplings quite readily. The chips are shovelled into large wooden hoppers, into which steam is introduced from a large Cornish boiler. There are three steam-heated vats, and the liquor is transferred from one to the other, pumped into elevated tanks, and thence allowed to flow from a tap on to steam-heated evaporating pans, about 30 or 40 feet in length. The evaporation is so rapid that in traversing the pans from the one end to the other the liquid is converted into a thick, tenacious, treacly extract. At the end of the pans it flows into a cistern, and thence by a kind of treacle-gate into the casks, each of which will hold about 10 cwt. All that now remains to be done is paste on a label, put in a bung, weigh the cask, and send it off to market. In the process of evaporation a certain portion of the tannic acid is destroyed. The plant can be easily moved from

* This is doubtful. Wattle-bark extract is several times alluded to as an ordinary article of commerce in P. Cunningham's "Two years in New South Wales," published in 1827.

place to place. It does not pay to cart the trash far, but a few square miles of wattle country will keep a factory going. The utilisation of thinnings allows the cultivation of the tree thickly on waste ground, and to begin cutting the third year. European tanners are quite accustomed to the use of such extracts, but it is said that it will be very hard to introduce it into the colonial tanneries."—(*Chemist and Druggist*, 1886.)

These works are still in successful operation, although mucilage still gives some trouble. Wattle twigs are rich in gum and mucilage, and some cheap process, which will get rid of these substances and leave the tannic acid uninjured, is a desideratum.

I have received many inquiries as to whether the difficulty has been overcome, but I have had to reply in the negative, as far as a commercial process is concerned. There is very little gum in clean-grown bark, but far more in chopped twigs; extract will not be made from the former except in almost inaccessible districts.

Of course, the extract in all stages of its manufacture must be preserved from contact with iron. Wooden vats are employed, and the heat for evaporation is obtained from hot water or steam. The waste bark, chips, &c., used in the preparation of the extract are first digested in cold water, and by having a series of vats, with communicating tubes or siphons, a charge of bark can be transferred from one to another until it is exhausted to such an extent that the small remaining percentage of tannic acid can only be removed by hot water.

The vats are constructed so as to expose a maximum of evaporating surface to the atmosphere, and if the evaporation can be carried on wholly or in part by means of the heat of the sun, so much the better, firstly, because the consumption of fuel will be minimised, and secondly, because the process should be conducted at as low a temperature as convenient.

The preparation of wattle bark extract has been attempted in all of the colonies, but in only one has it passed the experimental stage, so far as I know. The process is analogous to "concentration" in metallurgical operations, for the tannic acid in bulky, unsaleable material can be highly concentrated, and barks weak in tannic acid can be utilized for the same reason. The industry of extract-making is tempting, and I am confident that there is much money in it for some of our country districts whose circumstances are favourable. I trust, therefore, that it will soon be the means of affording profitable occupation to many people.

The dark colour of extracts is an objection, and many experiments have been undertaken with the view to minimise the evil, with no very satisfactory

results up to the present. Nothing is easier than to decolorise extract, but the difficulty is not to destroy the tannic acid at the same time.

The following notes relating to the making of extract of hemlock bark are taken from Proctor's "Text-book of Tanning," and may be suggestive :—

"The bark, in pieces ½–1in. thick and several inches long, is soaked for about fifteen minutes in water at 200 deg. F. (93 deg. C.); it is then fed into a hopper, which conducts it to a 3-roller machine, something like a sugar-cane mill, through which it passes, coming out lacerated and compressed; it next falls into a vat of hot water, where it is agitated by a wheel that the tannin from the crushed cells may be dissolved in the water; hence it is raised by a series of buckets on an endless chain, somewhat in the manner of a grain elevator to another hopper, whence it is fed to another 3-roller mill; here it receives its final compression, and comes out in flakes or sheets, like coarse paper, and almost free from tannin. The buckets are made of coarse wire that the water may drip through during elevation. In order to avoid the blackening action of iron, whenever this metal will come into contact with the solutions it is thickly coated with zinc. The solution is evaporated to a solid consistency, generally by vacuum-pans. About 2 tons of bark are represented by 1 barrel (of less than 500 lb.) of extract."

And, again,—"It is one of the great attractions of extracts that they avoid almost all the expense and labour inseparable from the exhaustion of other tanning materials. It is usually necessary to dissolve the fluid extracts in water or liquor of as high a temperature as has been employed in their preparation, as otherwise, from some unexplained chemical change, a large portion of the tannin is precipitated, probably as an anhydride of tannin."

A South Coast correspondent informs me that he has obtained 1 ton of extract, 40 *per cent.*, from 4 tons of hickory or black-wattle bark (*Acacia penninervis*, var.) There is now a good market in Europe for well prepared wattle bark extract, but the demand has only sprung up again within the last few years.

The following notes on extracts from the Moruya district examined by me may be interesting :—

1. Hickory extract (*Acacia penninervis*), of the consistency of thin treacle, contains only 20·25 per cent. of tannic acid, 61·15 per cent. of water, and 8·2 per cent. of gum precipitated by alcohol after twenty-four hours. The phlobaphenes and other organic substances were not estimated. Damaged by over-heating and over-concentration.

2. Hickory extract (dry) forming a blackish powder having a "burnt" smell. Wholly soluble, but not without heating slightly; it remained twenty-four hours in cold water without entirely dissolving. It yielded 41·5 per cent. of tannic acid, and 17·1 per cent. of moisture, but the destruction of tannic acid must have been very great, and there is no necessity to go into the manufacture of dry extracts until the preparation of the easier wet extracts is on a better footing.
3. Green wattle extract (*Acacia decurrens*) dry. Wholly soluble in cold water in a short time, contains 40·5 per cent. of tannic acid, and 15·7 per cent of water.

A Queensland correspondent took *Acacia harpophylla* bark (found to contain 11·59 per cent. of tannic acid). He converted it into extract of specific gravity 1·281, the percentage then being increased to 33·82. He found that 5·81 parts of bark were required to make one of extract.

WATTLE GALLS.

Galls, of course, play an important part in tanning, particularly in European countries; but it does not appear that wattle galls are likely to be of any commercial importance. On some wattles, and particularly when they are growing in uncongenial surroundings, or suffering from senile decay, galls are very abundant, but usually they are of irregular shape (unlike oak galls), and are dark-coloured and friable after the insect has made its escape. Following are analyses of two species, for reference:—*Acacia binervata* (Illawarra, New South Wales), 8 per cent. of tannic acid, and 21·75 per cent. of extract; *Acacia dealbata* (Braidwood district, New South Wales), 3 per cent. of tannic acid, and 13·6 per cent. of extract.

WATTLE GUM.

Those interested in this subject are referred to my paper in the *Pharmaceutical Journal* of London for the year 1890, (*Pharm. Journ.* [3] xx, 869 and 980) entitled "The Chemistry and Commercial Possibities of Wattle Gum," in which the subject is discussed from a botanical, chemical, and commercial stand point. The great bulk of the paper is based on my own original researches.

PART II.

The Various Kinds of Wattle Barks.

(Good, Bad, and Indifferent.)

I have already referred to the fact that in Australia the term "wattle" is applied to species of *Acacia*. Acacias are very largely developed in this continent, there being about 312 of them, of which New South Wales boasts 102, and a fresh one is occasionally discovered. The barks of all are more or less astringent, owing to the tannic acid they contain, but most of them are useless to the tanner, for three reasons—they are either of too small a size to strip profitably, their bark is too weak in tannic acid, or they are not sufficiently abundant. Nevertheless a number are more or less useful, and the object in furnishing the specific information in regard to each wattle which follows is threefold, viz., to give information in regard to the percentage of tannic acid in those barks already used by the tanner, to draw his attention to other barks worthy of notice, and to put him on his guard* in regard to what, for his purpose, may be termed worthless species. Most of the analyses given are my own, and refer chiefly to New South Wales barks; I hope, however, to be able to add more analyses of the wattle barks of the other colonies from time to time.

The species are true to name, herbarium specimens having been collected in most instances where analyses are given. The local names are also made as complete as possible. Altogether it is the most comprehensive catalogue of wattle barks which has been published up to the present time.

A number of analyses are now published for the first time. They are by Löwenthal's improved process. Partly through the kindness of friends, and partly through the energy of the Museum Collector, there is in the Technological Museum the most extensive collection of wattle barks I know of anywhere. I have collected many with my own hands.

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* I am quite aware that some of the barks are so worthless that it would be ridiculous to suppose that any tanner would ever dream of using them.

They are listed in botanical order, since this has the advantage of bringing closely-related wattles together. There is a full index and also tables at the end to facilitate reference. It will become evident to the reader who bestows a moment's reflection on the subject that it is impossible for me to arrange these wattles under their local names, for the reason that some have several names, while the same name, also, is occasionally held by several. As this little book is primarily intended for non-botanists, I regret I have no alternative but to give what appears to be most prominence to the botanical names.

I shall be glad at all times to receive twigs of wattles in flower, or showing pods, and will supply the botanical names if desired.

SPECIFIC DETAILS OF EACH BARK.

1. *Acacia colletioides*, A. Cunn., B.Fl.,* ii, 325.

"WAIT-A-WHILE" (a delicate allusion to the predicament of a traveller desirous of penetrating a belt of it).

Some bark from a very old shrub was examined by the author, and yielded 4·4 per cent. of tannic acid† and 10·56 per cent. of extract. (*Proc. R.S., N.S.W.*, 1887, p. 87.) It consisted of little more than fibre. This is a dry country wattle, and the most favourable specimen of it is not likely to be of use to the tanner, since apart from its small percentage of tannic acid it is but a shrub.

New South Wales, Victoria, South and Western Australia. In the two first colonies, at any rate, it is not found in the coast districts.

2. *Acacia siculiformis*, A. Cunn., B.Fl., ii, 329.

A tallish shrub merely. The bark not to be distinguished from that of *A. pravissima* (page 46). I analysed (April, 1890), a sample of bark from Jindabyne, Snowy River, N.S.W., collected January, 1890; height, 6 to 10 feet; diameter, 1 to 4 inches; grown on granite soil. It contains 7·87 per cent. of tannic acid, and yields 31·85 per cent. of extract.

Found in the mountains and high table-lands of New South Wales (southern), Victoria, and Tasmania.

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* B.Fl. signifies "Bentham's Flora Australiensis," and the references given are of the places at which botanical descriptions of the various wattles may be obtained.

† *Important memorandum.*—The analyses given are all calculated on the bark dried at 100° C., the only way in which uniform results can be presented.

3. *Acacia tetragonophylla*, F. v. M., B.Fl., ii, 330.

"DEAD FINISH."

A sample of this bark from Tarella, Wilcannia, N.S.W., from a tree whose height was 10 to 12 feet and diameter 6 to 8 inches, was examined by the writer (*Proc. R.S., N.S.W.*, 1888, p. 267), and gave 5·59 per cent. of tannic acid, and 14·96 per cent. of extract. It was collected August, 1887, and analysed August, 1888. This is one of the usual dry-country wattle barks, consisting almost entirely of bundles of fibre, even the hoary outside bark being more or less readily separable into long ribbons.

A western and desert species occurring in New South Wales, Victoria, South Australia, and Queensland, not found in the coast districts, nor, I believe, in the mountain ranges. Its chief habitat is the country west of the Darling.

4. *Acacia rigens*, A. Cunn., B.Fl., ii, 337.

"NEALIE," or "Needle Bush."

Bark from an old tree, from near Hay, New South Wales, yielded the author 6·26 per cent. of tannic acid and 19·05 per cent. of extract. (*Proc. R.S., N.S.W.*, 1887, p. 88.)

It consists of but little else than layers of fibre. A dry-country wattle. South Australia, Victoria, and New South Wales.

5. *Acacia calamifolia*, Sweet, B.Fl., ii, 339.

"WILLOW" or "BROOM WATTLE." "Wallowa" of the aboriginals of Lake Hindmarsh Station (Victoria).

A sample of bark in the Technological Museum, received in the year 1883, was stated to contain 20·63 per cent. of tannic acid, according to an analysis by Mr. Thomas, of Adelaide. It was labelled "*A. calamifolia.*" I analysed this bark, which came from the Murray Flat Ranges, South Australia, and found it to contain 36·06 per cent. of tannic acid, yielding no less than 63·1 per cent. of extract. It is nearly $\frac{5}{16}$ of an inch thick, solid, smooth, containing very little fibre, and hardly to be distinguished from *A. pycnantha* bark. I received it, however, under the name by which I now describe it, and the tree is not personally known to me.

The bark is a superb one. As to the discrepancy between my analysis and that of Mr. Thomas, I can state that I have proved that barks stored in a dry place increase in percentage of tannic acid; but what that percentage is, or whether any generalisation can be made, my experiments hardly yet warrant me in stating. Mr. Thomas' figures may have been based on a very different sample of the parcel to that which has come into my hands, but what the percentage of tannic acid was in my particular specimen in 1883, can only be guesswork. My analysis was made April, 1890. I draw attention, in this context, to the footnote at page 31, in regard to my analyses all being calculated on the bark freed from moisture.

I received this particular bark from a firm of the highest reputation, and I am confident that no transposition of labels has occurred in this Museum. So far as I know, *A. calamifolia* does not attain a size sufficient to yield bark similar to that under examination, and I trust that correspondents will kindly enable me to state the proper position of *A. calamifolia* as a bark-yielding wattle.

A. calamifolia is recorded from South Australia, Victoria, and the extreme west of New South Wales.

6. *Acacia armata*, R.Br., B.Fl., ii, 347.

"KANGAROO THORN."

The bark strips very easily, and the shrub never attains any size. The bark is, of course, thin; it is also smooth on the interior, and of a light-brown colour. Externally the colour is of a dirty-grey, and has numerous transverse markings of a lighter colour. The bark appears to be characteristic of this species. As a tan bark it is useless, a specimen from Tomakin, Bateman's Bay, N. S. W., from trees 12 to 20 feet high, having a diameter of from 2 to 4 inches, collected 18th June, 1890, and analysed January, 1891, was found to contain only 3 per cent. tannic acid, and 18·15 per cent. extract.

In New South Wales it occurs near Bateman's Bay, Mosquito Bay, and Tomakin. It grows round swamps and near creeks along the sea-coast, and it appears seldom to occur further than about a mile from the sea. It is usually found in dense, almost impenetrable masses, which circumstance, added to its prickly nature, has given it its common name, and has also caused it to come into use for hedge-planting.

It is also found in all the colonies, except Tasmania.

7. *Acacia verniciflua*, A. Cunn., B.Fl., ii, 358.

This small tree (height, 20 to 25 feet, with a diameter 2 to 5 inches), exudes a sticky substance from the leaves, hence the specific name. The appearance of the bark reminds one irresistibly of Cascarilla. It is full of fibre, and of no use to the tanner. A specimen collected in April, 1889, on the Delegate River, N.S.W., in granite country, was analysed by me the following April, and found to yield only 3·16 per cent. of tannic acid, and 22·35 per cent. of extract.

Found in New South Wales, Victoria, South Australia, and Tasmania, chiefly on mountains and high table-lands. In the south-east in such situations it does not extend further north than the Bombala District; out west it was found both by Cunningham and by Mitchell.

8. *Acacia sentis*, F.v.M., B.Fl., ii, 360.

A "THORNY WATTLE."

A specimen of a dirty-grey scaly bark ⅝ of an inch thick, from Ivanhoe, N.S.W., yielded me 18·02 per cent. of extract, and tannic acid 6·32 per cent. (*Proc. R.S., N.S.W.*, 1887, p. 29.)

A second sample from Cobham Lake, Milparinka, N.S.W., was analysed by me August, 1888. (*Proc. R.S., N.S.W.*, 1888, 268.) Tree, height 15 to 20 feet, diameter 4 to 6 inches, collected, August, 1887. It yielded:—tannic acid 10·26 percent., extract 33·82 per cent. This bark would scarcely be taken for the product of a dry-country wattle. It is from a younger tree to that already described, and is almost perfectly smooth and of a light-brown colour. The collector reports, "When fresh it is of a beautiful bright-green colour, much like the bark of *A. decurrens*. I have found it easier to strip than any other bark I have stripped yet out west." It is very compact. Average thickness, ⅛ inch.

An inland, desert species. In all the colonies except Tasmania.

9. *Acacia falcata*, Willd., B.Fl., ii, 361.

Called "BASTARD MYALL," in the Braidwood District, N.S.W. It also goes by the names of "Hickory," "Sally," and "Lignum-vitæ." It was formerly the "Wee-tjellan" the aboriginals of Cumberland and Camden, N.S.W. (Macarthur.)

It is said to yield a good tanning bark, but it is usually of rather small size, and not likely to be of importance to the tanner.

On the coast districts, and on to the dividing range, in New South Wales and Queensland; its farthest southern locality is the Shoalhaven River.

Acacia penninervis

Mountain Hickory

5a* 76-91(2)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

10. *Acacia penninervis*, Sieb., B. Fl., ii, 362.

Usually called "HICKORY," or "Mountain Hickory," from Braidwood to the Victorian border. Sometimes called "Blackwood;" occasionally called "Black Wattle," e.g. Blue Mountains.

The greater amount of wattle bark used by Australian tanners, or exported from our shores, is the produce of two species of Acacia—namely, *Acacia decurrens* (and its varieties) and *Acacia pycnantha** I propose to show that there is another wattle of surpassing excellence, one worthy to be mentioned in comparison with these two. Hardly a year ago I examined a wattle bark from the extreme south of this Colony, quite different in appearance from the smooth barks which are usually associated in Australia with high percentage of tannin. To my surprise, I found it to contain 34 per cent. of tannic acid. I repeated the experiments with fresh samples, but the results never varied 1 per cent. altogether. In other words, this bark contains one-third of its weight of tannic acid, calculated on the dry bark. I made the welcome announcement in an official publication, and the receipt of numerous samples since has shown me that bark of the particular quality is not as scarce as I had supposed it to be. So many communications have reached me, particularly from Queensland, in regard to this matter, and the subject is of such great commercial importance to our Colony, that I take this opportunity of stating all I know about it. Unfortunately there are several so-called hickories in this Colony, and, therefore care is necessary to discriminate the right one. That hickory which looks like a pepper tree and which is found on the banks of water-courses and in gullies in the Blue Mountains, and also at Picton, Bargo, Mittagong, and other places in the Southern districts, is *Acacia elata*. Most of our hickories (and *Acacia penninervis* is no exception), however, are *phyllodinous;* that is to say, their leaves are not true leaves, but what are called *phyllodes* (Greek, "like a leaf"), and are structurally simply an expansion, or flattening out of the leaf-stalk. Amongst these, which are known as hickory in different places, are *Acacia binervata* (one of the black wattles), *Acacia longifolia* (our Sydney golden wattle), and even the blackwood (*Acacia melanoxylon*), and the closely allied *Acacia implexa*.

It is worthy of note that in some districts in which mountain hickory occurs the bark has never been stripped and tried, for the reason that people do not look upon it as a wattle, imagining it to be a gum-tree! This state of things is passing away, as the bark is now becoming appreciated in certain quarters, to my personal knowledge, and it is only another instance of the unknown wealth waiting to be known, and therefore utilised.

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* This account of "Mountain Hickory" bark is founded on an article by the author in the *Sydney Mail* of 21st February, 1891.

My readers will observe from the drawing how variable in size and contour are the leaves (*phyllodia*) of the mountain hickory. It is, in fact, a very variable species, but it may be usually known (though the test is not an infallible one) by means of the thickened dot or gland which is found a little distance along the rim (or marginal vein) of the leaf, and from which another vein extends, in a curved manner, to the leaf-stalk. A small leaf-shaped enclosure, varying in size, is thus partitioned off out of the area of the leaf itself.

A specimen, too, from near Moruya has very narrow leaves, varying in breadth from a quarter to half an inch, and from 8 inches to 12 inches in length. Another, from Mount Dromedary, has its leaves 8 inches long and 2¼ inches broad. The average size, however, may be given as 5 inches long, and 1 inch broad. This will explain why different trees are known as narrow-leaved and broad-leaved mountain hickory respectively.

I proceed to give a number of analyses of representative samples of this bark from different places in New South Wales. I have already alluded to one bark which gave 34 per cent. of tannic acid; it also yielded 55·2 per cent. of extract, and came from Brown's Camp, near Delegate. I have not come across a finer sample of this bark, though there is much of equal quality. The mature trees which yielded this excellent result must have each contained half a ton of bark. They grew on a mountain side, sloping west, on poor soil, and associated with the native cherry (*Exocarpus cupressiformis*), also of extraordinary large dimensions.

Bark from Mount Dromedary, in the same district, stripped in December, gave 32·25 per cent. of tannic acid, and 53·15 of extract. A sample grown at Mount Victoria (Blue Mountains), stripped in June, gave 29·03 per cent. of tannic acid and 57·25 per cent. of extract. Height of the tree, 40 feet; diameter of stem, 6 inches. Bark from Rylstone (Mudgee line), stripped in December from young (immature) trees, yielded 25·25 per cent. of tannic acid, and 42·45 per cent. of extract. All the above are from the "broad-leaved" variety.

The following are "narrow-leaved." Bark from Nelligen, stripped in December gave 32·25 per cent. of tannic acid, and 52·8 per cent. of extract; while a specimen from the Dromedary, much further south, gave an almost identical result—viz., 32 per cent. of tannic acid, and 52·7 per cent. of extract.

The following analysis was given by the Queensland Commissioners, Colonial and Indian Exhibition, 1886:—Tannic acid, 14·49 per cent.; extract, 33·06 per cent. I have received a Queensland sample from Dr. T. L. Bancroft,

of Brisbane, who obtained it from Enoggera. It was from trees 15 feet in height and 6 inches in diameter, was collected in May and analysed in July. It gave 18·24 per cent. of tannic acid and 35·95 of extract; but the bark is too thin, and it gives too dark coloured a liquor for it to be looked upon very favourably.

In an official report for the Melbourne Intercolonial Exhibition of 1866, Baron Mueller incidentally mentioned that a sample of this bark contained 17·9 per cent. of tannic acid, not a result sufficient to excite any great expectations.

As regards the occurrence of the mountain hickory in Victoria, Baron Mueller speaks of it as scattered through the eastern half of the Colony, over ridges and ranges, gregarious on some of the sub-alpine declivities and plateaux. He speaks of it (1885) as "a usually small tree," but subsequent exploration towards the New South Wales border may cause this to be modified.

It is found also in Tasmania, but apparently only on Mount Wellington. It has a wide range, as it extends to Southern Queensland, but New South Wales seems to be the natural home of the tree. In our Colony it extends from South to North, in the eastern half, on the southern ranges, the Dividing Range and its spurs, and the New England district.

While this species is so abundant, and so extensively distributed, it would appear that only bark from Southern New South Wales is of any great commercial value, and I therefore give particulars of such localities in a little more detail.

It is found from the Clyde and Bateman's Bay district, all along the coast land, right down south to the boundary of Victoria. On the eastern mountain slope and ranges it attains a good height (20 feet to 40 feet), with a diameter up to 18 inches. Trees a foot in diameter are common. It is found a good size along the strip of forest land fringing the plains of the Monaro. The largest trees appear to occur in the mountain ranges near Delegate, which form the southern boundary of the Monaro, where for instance, near Brown's Camp (the locality from which I first obtained the samples which enabled me to draw attention to the extraordinary value of this bark), the trees attain a height of from 40 feet to 80 feet, and a diameter up to 2½ feet, while trees of a diameter of 18 inches to 24 inches, are not scarce in the locality.

Nelligen, Moruya, Araluen, Tilba, Cobargo, Colombo, Bega, Candelo, Bombala, Delegate, and the Twofold Bay district are good localities.

The following notes from a Southern correspondent who forwarded me some barks, include some additional localities :—

"No. 1. Local name Hickory or Black-wattle, taken from a tree 40 feet in height, 16 inches in diameter, growing plentifully on ridges and high lands in the parishes Wagonga, Noorooma, Tilba, Bodalla, and neighbourhood, county of Dampier, for miles round the base of Mount Dromedary, soil generally light on slate formation.

"No. 2. Local name Broad-leaved Hickory, though not so plentiful as No. 1, yet in abundance, more particularly about Milton, Bermagui, Tilba Tilba, Reedy Creek, Cobargo, and along Tuross River. It is not uncommon to see trees 2 feet in diameter, that from which No. 2 specimen was taken, measured 20 feet in height and 12 inches in diameter."

If possible, no tree under a foot in diameter should be stripped ; immature trees give little bark, which contains comparatively little tannic acid. To strip mountain hickory saplings is simply killing the goose with the golden eggs. It is not surprising that so large a tree yields rather a thick bark. A certain specimen is over five-eighths of an inch thick, is rugged, something like an ironbark, only more stringy.

11. *Acacia retinodes*, Schlect., B.Fl., ii, 362.

Said to yield a good tan bark. South Australia and Victoria.

12. *Acacia neriifolia*, A. Cunn., B.Fl., ii, 363.

A "BLACK WATTLE."

The following analysis of the bark is given by the Queensland Commissioners, Colonial and Indian Exhibition, 1886 :—Tannin, 13·91 per cent. ; extract, 17·87 per cent. (*sic*).

New South Wales and Queensland. On river banks and mountains in the coast districts from the Clyde River, in Southern New South Wales, to South Queensland.

13. *Acacia saligna*, Wendl., B.Fl., ii, 364.

"WEEPING WATTLE."

In South-west Australia it is the principal source of tan bark, and is said to contain nearly 30 per cent. of tannic acid. It is a small tree, common in most parts of extra-tropical West Australia, at least towards the coast. (Mueller.)

Acacia pycnantha

South Australian Golden or Broad-leaved Wattle.

5a.* 76–9/(c)

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It grows rapidly in the Sydney and Gosford districts. A specimen of bark, very thin, taken from a three-year-old sapling grown at the North Shore, Sydney, stripped in June, and analysed the following February, gave the very promising result of 28 per cent. of tannic acid, and 46·15 per cent. of extract. It is quite worthy of more extended trial in New South Wales.

14. *Acacia pycnantha*, Benth., B.Fl. ii, 365.

The "BROAD-LEAVED WATTLE" of South Australia; called also "Golden, Black, or Green Wattle." It was known under the name of "Witch" by the aboriginals of Lake Hindmarsh Station, Victoria.

One of the richest tanning barks in the world; a richer may exist, but I do not know of it. A sample of this bark was received by me in 1883 from Messrs. F. Pflaum & Co., of Blumberg, South Australia, with the note "contains 33·5 per cent. of tannin, according to Mr. Thomas, of Adelaide." I analysed the sample in April, 1890, and obtained the following extraordinary result by Löwenthal's improved process—the process I always adopt, viz.:—

Tannic acid	... ...	46·47 per cent.
Extract	... ...	74·7 „

This has been stored seven years in the Museum, and has doubtless increased in percentage of tannic acid during that period. Nevertheless it is the grandest specimen of wattle bark I have ever examined. It is smooth, a model of compactness, contains a minimum of fibre, and therefore powders splendidly, is of good colour, and an excellent bark in every way. South Australia has practically the monopoly of this bark, and it is a grand heritage,—the envy of the eastern colonies.

A second sample forwarded to me April, 1890, and analysed the same month, is from the vicinity of Mount Torrens, 20 miles east of Adelaide, and was obtained from Mr. J. E. Brown, then Conservator of South Australian Forests, through the courtesy of Mr. Albert Molineux, Secretary of the Agricultural Bureau of that Colony. It yielded 39·1 per cent. of tannic acid, with 73·5 per cent. of extract. It is of course an admirable bark, but it is thinner than the preceding sample, and would at once strike an expert as second to it. But even this contains nearly 3 per cent. of tannic acid more than any other sample of wattle bark of other species I have examined. It is, however, only fair to say that I have been unable to procure samples of the best brands of Tasmanian *decurrens* bark.

In forwarding the sample, Mr. Molineux says,—"The bark was taken from a height of about 2 feet above ground. It was from a large tree, of which there have been, and still are, great numbers in the locality. Mount Torrens district is the best in the Colony for rich good bark.

The following are results of analyses of thirteen samples of *A. pycnantha* bark received from Mr. J. E. Brown. They were stripped 29th April, 1890, analysed a month later, and were grown on the Government Farm, Belair, S.A. Height of trees, from 8 to 14 feet.

No.	Age, Diameter, and part of Tree from which taken.	Percentage of Tannic Acid.	Percentage of Extract.	Geological Formation, Soil, &c.
1	From butt of tree; diameter, 3½ in. (Age, about 5 years.)	37· 5	63· 9	Nos. 1 to 7 are taken from trees growing in an uneven basin, between the lower and upper ranges; soil, light sandy loam over gravel wash and yellow clay.
2	From limb of No. 1	33·75	63·25	
3	From butt of tree; diameter, 2 in. (Age, 4 years.)	28· 5	57·75	
4	From butt of tree; diameter, 1¾ in. (Age, 3 years.)	36 25	68·35	
5	From butt of tree; diameter, 2 in. (Age, 4 years.)	36· 5	64·25	
6	From butt of tree; diameter, 2½ in. (Age, 4 years.)	37· 5	65·35	
7	From limb of No. 6	32·95	63 25	
8	From butt of tree; diameter, 4½ in. (Age, 5 years.)	37·25	64· 5	No. 8, from the S.W. slope of the upper ranges; soil, light clay over bed rock of hard sandstone.
9	From limb of No. 8	38· 5	65· 2	
10	From butt of tree; diameter, 2 in. (Age, 4 years.)	35·95	63· 4	No. 10, from the top of upper range; soil, about 2 in. of light sandy loam over bed rock of hard sandstone.
11	From limb of No. 10	32· 1	63· 1	
12	From butt of tree; diameter, 3 in. (Age, 5 years.)	35· 5	64·85	No. 12, from N.E. slope of upper range; soil, same as No. 10.
13	From butt of tree; diameter, 4 in. (Age, 7 years.)	35·45	63· 5	No. 13, same as No. 8.

It will be noticed that in three cases, Nos. 2, 7, and 11, the results of analysis are slightly lower than that of the bark gathered from the butt of the same tree, but in the case of No. 9 the result is slightly higher, the appearance of the bark when powdered, of No. 8, was too dark to be first class, while that of No. 9 was the best of the whole thirteen samples, and gives the best result.

The powder from the bark of the limb is generally of a lighter colour than that taken from the butt, although the powders of Nos. 5, 10, and 12 were very light for bark taken from the trunk of the tree.

The bark of No. 3 was not first class, being far too fibrous.

In Part III of the *Forest Flora of South Australia*, by J. E. Brown, the following analysis of this bark by Mr. G. A. Goyder, Superintendent of the Crown Lands Laboratory at Adelaide. The localities are all South Australian.

Locality where grown, elevation, &c.	Character of soil upon which grown.	Age of tree.	Weight of bark from each tree.	Thickness of bark.	Portion of tree which taken.	Percentage of tannin.	Total extractive matter.
Government Farm—		Yrs.	lb.	in.			
Belair, elevation	Sandy loam, with				trunk	34·0	55·3
1,000 ft.	clay sub-soil ..	6	45	0·22	wood and	5.1	20·5
Do	do ...	6	...	...	bark of twigs.		
Torrens Island—							
Almost sea-level.....	Deep sandy soil ..	5	38	0·23	Trunk	25·2	46·5
Do	do ...	5	...	0·04	Twigs	21·7	40·8
Bundaleer Forest—							
Elevation 1,800 ft....	Ferruginous loam, with clay sub-soil.....	7	128	0·20	Trunk	31·4	49·9
Do ...	do ...	7	...	0·05	Twigs	22·3	45·6
Semaphore—		Abt.					
20 ft. above sea-level	Deep sand.....	30	307	0·18 (*sic*)	Trunk	25·8	42·6
Brighton—							
20 ft. to 30 ft. above sea-level	Clay soil	6	...	0·21	Trunk	28·7	53·4
Do	do	6	...	0·03	Twigs	25·3	41·6
Mount Gambier.....	Calcareous sand..	7	...	0·13	Trunk	31·7	52·0

I am of opinion that these analyses under-rate the value of *Acacia pycnantha* bark, and are open to other objections.

Mr. J. E. Brown, when in South Australia, cultivated this species very largely in districts found suitable for it, and his general remarks on wattle cultivation (*ante*) were chiefly written with this species in view.

"Except in very dry localities, this species is common to nearly all districts of South Australia north of Encounter Bay, and is occasionally to be met with along the coast from Kingston to the Glenelg River. Its principal habitat, however, and the one where the thoroughly typical botanical form and the largest trees of the species are found, is in the Adelaide hills and plains, from Encounter Bay to Clare. For propagation purposes seed should, if possible, be obtained from trees grown within these limits. In some parts of the north of the Colony there is a narrow-leaved variety, with the stem and branches covered with a whitish substance, which is desirable should not be propagated, as the tree is of slow growth, and does not attain payable dimensions." (J. E. Brown. Reports.)

Average height of typical form 20 to 25 ft., and diam. 6 to 10 in. (Brown.)

Mr. Brown gives the life of this tree at from ten to twelve years, and states that it may be stripped from the sixth to the ninth year, according to circumstances. It lives longer in sandy soils than in clay ones.

The following six barks of this species, were forwarded to the Museum by Mr. A. L. Thrupp, Ballannah, South Australia. They form a very interesting series, consisting as they do of samples of the best bark obtainable, together with very inferior and ordinary specimens, grown under varied influences of soil and climate :—

No. 1 is a splendid sample of the bark of this wattle, it is thick, fairly smooth, and was taken from a tree of large diameter, it was grown at Mount Torrens, South Australia; analysed August, 1890, and found to contain 42·1 per cent. tannic acid, and 67·75 per cent. extract.

No. 2. This is also a good specimen of bark, it was grown at Oakbank, South Australia; analysed August, 1890, and found to contain 41·75 per cent. tannic acid, and 71·38 per cent. extract.

No. 3. Grown at Millicent, South Australia, in sandy soil, it was taken from a tree of fair size; analysed August, 1890, and found to contain 35·5 per cent. tannic acid, and 68·9 per cent. extract.

No. 4. This is an inferior looking bark, scaly and fibrous; it was taken from trees growing in scrub country near Blumberg, South Australia; analysed August, 1890, and found to contain 30 per cent. tannic acid, and 59·6 per cent. extract, which result must be considered good from such an unpromising looking bark.

No. 5. Grown at Melrose, South Australia. The bark is from young trees, and not at all promising in appearance. It was analysed August, 1890, and found to contain 21·2 per cent. tannic acid, and 42·3 per cent. extract.

No. 6. This is a thin, fibrous, scaly and very inferior looking bark, taken from trees growing at Carruson, South Australia, where, owing to insufficient rainfall, they are stunted in growth; analysed August, 1890, and found to contain 15·1 per cent. tannic acid, and 32·75 per cent. extract.

Mr. G. S. Perrin summarises the advantages of this species over *A. decurrens* by stating that the former species is more amenable to culture, and can be pruned to a better shape, occupies less space in the plantation, and is much better stripped.

Baron Mueller (*Select Extra-tropical Plants*) says:—"It is of rapid growth, content with almost any soil, but is generally found in poor sandy ground near the sea-coast, and thus also important for binding rolling-sand."

In an earlier portion of this work I have gone into the question of soil, &c. Generally speaking, it loves a warm climate, with only a moderate rainfall. It therefore will not usually flourish at elevations over 2,000 ft.

Acacia salicina

5a*76-91(i) **Cooba or Native Willow**

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I have already dealt with the matter of localities. It is essentially a SouthAustralian species, though it extends into both Victoria and New South Wales.

So-called delicate plants, such as this species, may be successfully grown in rather cold districts, *e.g.*, Blue Mountain, Moss Vale, &c., in New South Wales, by taking advantage of a fact well known to gardeners, viz., they should be planted with a westerly aspect, so that the sun will not shine on them to early after a severe frost.

A New Zealand correspondent writes:—"*Pycnantha* trees, 4 years old, are 6 feet high, and 2 inches in diameter at 3 feet from the ground, in the Auckland district of New Zealand. Land rather strong, with sand in it, and on a clay sub-soil."

In another instance in this district, the scrub was cut, the land ploughed in strips, 10 feet apart, and the seed drilled in at the rate of 1 lb. to the acre. Since then the trees have been allowed to grow wild, never having been thinned or the land cleared, or, in fact, having one penny spent on them. In 6 years the best trees are over 10 feet high, and 3½ inches in diameter, and the *decurrens* trees are over 20 feet high, and 5 inches in diameter.

15. *Acacia amœna*, Wendl., B.Fl., ii, 366.

This tall shrub yields a good bark, which would be valuable if it were of large size. As it is, when dried, it is of the size of cassia-bark or coarse cinnamon. It is smooth, and yields a pale-coloured, rather fibrous powder.

A sample from Tantawanglo Mountain, near Candelo, N.S.W., from shrubs 8 to 12 feet high, with a diameter of 2 to 4 inches, and grown in granite soil, afforded 23·5 per cent. of tannic acid, and 45·85 per cent. of extract. It was collected July, 1889, and analysed April, 1890.

Found in New South Wales and Victoria; a coast and mountain species. Its most northern limit in the former Colony appears to be the Moruya district.

16. *Acacia salicina*, Lindl., B.Fl., ii, 367.

"COOBA," or "KOUBAH." "NATIVE WILLOW." "MOTHERUMBA."

Following is a condensed account of the analyses of two specimens of this bark recorded by me in *Proc. R.S., N.S.W.*, 1888, 268:—

a. Tarella, Wilcannia.—Height, 20 to 25 feet; diameter, 12 to 18 inches. Collected August, 1887; analysed August, 1888. A coarse, flaky bark, not so fibrous, more compact, and altogether more promising looking than most of the dry-country barks. Average thickness, up to ¾ inch, tannic acid, 13·21 per cent. Extract, 35·28 per cent.

b. Momba, Wilcannia.—Height, 30 to 40 feet; diameter, 12 to 18 inches. Collected August, 1887; analysed September, 1888. Not flaky on the outside like No. 1, but a harder, bonier bark, more rugged, but obviously a promising bark. Thickness, up to 1 inch. Tannic acid, 13·51 per cent. extract, 33·1 per cent.

A sample from the Lachlan River, New South Wales, which has been in the Technological Museum five years, is a good specimen of this bark, being fairly smooth, close, compact, and containing comparatively little fibre. It was analysed May, 1890, and found to contain 15·1 per cent. of tannic acid, and 32·75 per cent. of extract.

This species is undoubtedly worthy of conservation, and even culture, in the dry interior when it is found, particularly as the barks there are usually so poor in tannic acid. The blacks are aware of the value of this tan-bark, as they use it for tanning wallaby and other skins.

An interior species, found in all the colonies except Tasmania. Habitat, chiefly on banks of creeks and watercourses.

17. *Acacia linifolia*, Willd., B.Fl., 371.

A "SALLY."

(See *A. prominens.*)

Dr. T. L. Bancroft, of Brisbane, was kind enough to send me bark of this tree from Enoggera, near that city, and furnished the following note:—"In gullies this species grows to the height of 20 feet or more, but on dry ground is only a whip-stick; the same remarks also apply to *A. complanata.* Both these species grow on the edge of the scrub, and there thrive well." Height, 20 feet; diameter, 6 inches. [Memo.:—The tree never attains this size within 200 or 300 miles of Sydney.] Stripped in May; analysed in July; and found to contain 11·13 per cent. of tannic acid, and 28·15 per cent. of extract.

The bark analysed was poor, thin, and flaky externally. It is inclined to be fibrous, the thickness is under $\frac{1}{8}$ inch, and altogether it is not a promising bark.

Found in New South Wales and Queensland,—usually in the coast districts.

18. *Acacia prominens*, A. Cunn., B.Fl., ii, 371.

Reduced by Baron von Mueller to a variety of *A. linifolia*, Willd.

This is called "Grey" and "Black Wattle" near Sydney, but dealers will not have it, and it hardly pays to cut up and pass with better bark. A

sample of a black bark, stained, leopard-like, with whity-green patches, and bearing lichens, yielded the writer 18·03 per cent. of tannic acid, and 42·35 per cent. of extract. It was from Penrith, N.S.W.

A sample from Penshurst, Illawarra line, near Sydney, gave the author (*Proc. R.S., N.S.W.*, 1888, p. 269) 39·98 per cent. of extract, and 14·42 of tannic acid. Height of tree, 10 to 15 feet; diameter, 1½ to 2 inches; collected September, 1887; analysed August, 1888. A light-coloured bark, very thin, of the thickness of stout brown paper, and reminding one strongly of that of *A. longifolia.*

A very promising-looking bark obtained from the same locality in February and analysed the same month, gave 19·75 per cent. of tannic acid, and 46·95 per cent. of extract. It is fairly thick, pale in colour, has little fibre, and its low percentage of tannic acid is certainly disappointing. I doubt whether a finer sample of this bark is obtainable; if this surmise is correct, the value of this bark is fixed at under 20 per cent. of tannic acid.

A specimen from trees 15 to 20 feet high, and having a diameter of from 4 to 8 inches, was collected in February, 1890, at Krackenback Mountain, Jindabyne, N.S.W., and analysed January, 1891. It was found to contain 11 per cent. tannic acid, and 29·75 per cent. extract. This bark is deceptive in appearance, being smooth, breaking short, with little fibre, and altogether a fair-looking bark.

Found in Victoria, New South Wales, and Queensland. On the Snowy Mountains it occurs at elevations from 4,000 to 5,000 feet. It is an eastern species, found principally in the coast districts.

19. *Acacia brachybotrya*, Benth., B.Fl., ii, 373.

A "BLUE BUSH."

Two samples of this bark were forwarded to the Museum by Mr. A. L. Thrupp, Balhannah, S.A., with the intimation that it is used in the adulteration of golden wattle bark (*Acacia pycnantha*) in South Australia.

The bark had been chopped, and from its general appearance it certainly would be somewhat difficult to detect when mixed with some samples of *Acacia pycnantha* bark. With the better samples of *Acacia pycnantha* the detection of admixture should not be difficult.

The barks are thin, inclined to be scaly, are somewhat fibrous, and of a reddish colour. They were stripped and analysed August, 1890, one with the result of 21·1 per cent. tannic acid, and 47·3 per cent. extract; the other gave 18 per cent. tannic acid, and 46·15 per cent. extract.

The first specimen came from Hammond, S.A., the exact locality of the other is unknown.

A dry-country species, found in the interior of New South Wales, Victoria, and South Australia.

20. *Acacia podalyriæfolia*, A. Cunn., B.Fl., ii, 374.

Sometimes called "SILVER WATTLE."

The bark is used in tanning, giving a light colour to leather. The following analysis is given by the Queensland Commissioners, Colonial and Indian Exhibition, 1886:—Tannin, 12·40 per cent.; extract, 29·50 per cent. (Bailey).

Northern New South Wales and Queensland.

21. *Acacia vestita*, Ker, B.Fl., ii, 375.

Bark from near Bombala, N.S.W., yielded the author 50·82 per cent. of extract, and 27·96 per cent. of tannic acid (*Proc. R.S., N.S.W.*, 1887, p. 89).

It grew on limestone country, and was from a tree 18 inches in diameter. Analysis of a second sample from the same district gave an even better result, viz.:—33·2 per cent. of tannic acid, and 64·51 per cent. of extract. This is very similar in appearance to the bark of *A. decurrens*, for which it might be substituted without detriment. It is a most useful bark, but, unfortunately, not of wide distribution. It is at the same time one of the most beautiful of wattles, and therefore I feel the responsibility of pointing it out as a fit subject for the bark-stripper.

Southern New South Wales and Northern Victoria.—It is a highland species in the Monaro, N.S.W., and there very rare.

22. *Acacia pravissima*, F. v. M., B.Fl., ii, 375.

This tall shrub has a thin, dark-grey to blackish bark, which yields a light-coloured powder, containing an unusually small proportion of fibre. But the expense of stripping it would bar its use practically, even if the percentage of tannic acid caused it to be a temptation to the stripper. A sample from Jindabyne, Snowy River, collected January, 1890, and analysed the following April, gave tannic acid 10·66 per cent., and extract 31·75 per cent. It was grown on granite soil, and was from shrubs 8 to 12 feet in height, and having a diameter of 1 to 3 inches.

Southern New South Wales and Victoria.—A highland species, found on the banks of the Snowy River.

5a* 76-91(f)

Acacia vestita

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23. *Acacia subporosa*, F. v. M. (*supporosa* in Muell., Fragm. iv., 5), B.Fl., ii, 382.

"RIVER WATTLE."

A sample of bark from a Victorian locality yielded Baron Mueller 6·6 per cent. of tannic acid, and 1·2 per cent of gallic acid. (*Cat. Technological Museum, Melbourne*).

A sample from Colombo, Candelo, N.S.W., was collected in June, 1889, and analysed by me April, 1890. It is a smooth, thin, fibrous, light-coloured bark, strongly resembling that of *A. longifolia*. It is from trees 20 to 30 feet in height, and with diameters of 6 to 15 inches. It was grown in granite country. My analysis gave 6·6 per cent. of tannic acid, and 22·55 per cent. of extract, peculiarly coincident with the determination already given. I may mention that I have made determinations of gallic acid and impurities in all my analyses, and I shall be happy to give particulars in the case of individual barks to anyone who applies for them. They are not of sufficient practical importance to Australian tanners to print here. In this particular instance my determination of gallic acid was 1·16 per cent.

Found in coast districts in New South Wales and Victoria, on the banks of creeks and rivers. Its most northern extension for New South Wales appears to be the Shoalhaven River.

24. *Acacia homalophylla*, A. Cunn., B.Fl., ii, 383.

"CURLY or NARROW-LEAVED YARRAN." A "Myall." Called also "Gidgee."

A specimen of this bark gave the following result:—Tannic acid, 9·06 per cent., and extract, 21·51 per cent. (*Proc. R.S., N.S.W.*, 1887, p. 189.)

It was from an old tree, full of flakes, and could be pulled to pieces with the fingers. A dry-country bark, but hardly a fair specimen of that. Found in the interior of South Australia, Victoria, New South Wales, and Queensland.

25. *Acacia pendula*, A. Cunn., B.Fl., ii, 383.

"BASTARD GIDGEE" or "NILYAH." Usually known as "Myall."

A sample of this bark from Yandarlo, Wilcannia, afforded the author (*Proc. R.S., N.S.W.*, 1888, p. 269) 3·25 per cent. of tannic acid, and 14·52 per cent. of extract. Height of tree, 10 to 12 feet; diameter, 4 to 6 inches; collected September, 1887; analysed August, 1888. A typical representative of the dry-country wattle barks. It seems to consist of nothing but flakes and layers of fibre.

An inland and desert species of New South Wales and Queensland.

25*a*. *Acacia pendula, var. glabrata.*

A "YARRAN."

Bark from this variety, obtained from near Hay, N.S.W., yielded the author 7·15 per cent. of tannic acid, and 17·91 per cent. of extract. (*Proc. R.S., N.S.W.*, 1887, p. 89.)

A moderately deeply-fissured bark from rather an old tree, containing abundance of poor fibre. A dry-country wattle, and apparently of no promise.

26. *Acacia Oswaldi*, F. v. M., B.Fl., ii, 384.

"MILJEE." "KARAGATTA." Often called "Umbrella bush," as it is a capital shade tree.

The bark from an oldish tree has been examined by the author, with the following result:—Tannic acid, 9·72 per cent.; extract, 20·7 per cent. This much resembled the sample of *A. homalophylla* bark. (*Proc. R.S., N.S.W.*, 1887, p. 189.)

In all the colonies except Tasmania; an inland desert species.

27. *Acacia stenophylla*, A. Cunn., B.Fl., ii, 385.

A sample of bark from this wattle, obtained from Yantara, Milparinka, N.S.W., gave the author (*Proc. R.S., N.S.W.*, 1888, p. 270) 9·49 per cent. of tannic acid, and 24·46 per cent. of extract. Height of tree, 15 to 20 feet; diameter, 6 to 12 inches; collected, November, 1887; analysed, September, 1888. A rugged-looking, coarsely-fissured bark, possessing the characteristic appearance of those of the dry-country wattles. Average thickness, $\frac{5}{8}$ inch.

A dry-country species; found in all the colonies except Tasmania.

28. *Acacia melanoxylon*, R. Br., B.Fl., ii, 388.

The "BLACKWOOD," but also known as "Lightwood" and occasionally as "Black Sally," "Hickory," "Silver Wattle."

The bark of this highly valuable timber has usually gone to waste after the wood has been obtained from the logs. "The bark is, however, rich in tannic acid, and ought not to be left unutilised, though no trees of this species should be sacrificed for the sake of their bark alone." (Mueller.) A sample of bark from Monga, near Braidwood, N.S.W., yielded the author 11·12 per cent. of tannic acid, and 20·63 per cent. of extract. (*Proc. R.S., N.S.W.*, 1887, p. 31). It was apparently from an old tree, of a dirty brown

colour, with whitish patches, giving the whole a silvery appearance; has irregular vertical fissures, and this circumstance, with the small horizontal cracks, causes the outer bark to be readily detached in small flakes. The inner bark or bast is very strong, and would form an excellent coarse tying material for local use. I have not been able to get a more favourable specimen for tanning purposes.

All the colonies, except Western Australia and Queensland; chiefly a highland and mountain species, but also on the coast.

29. *Acacia implexa*, Benth., B. Fl., ii, 389.

I have analysed a sample of this bark (*Proc. R.S., N.S.W.*, 1888, p. 270). It gave 7·82 per cent. of tannic acid, and 20·54 per cent of extract. It is slightly bitter to the taste, owing to the presence of a saponin, but this sample is from an old cultivated tree, and the bitterness is less noticeable; hoary-looking, in layers and flakes; average thickness, ¼ inch.

Bark of this species from Deception Bay, has been sent to me by Dr. T. L. Bancroft, of Brisbane, and found to contain 14·16 per cent. of tannic acid, and 33·51 per cent. of extract. It was from a tree 15 feet in height and 4 inches in diameter. It was stripped in May, and analysed in July.

Victoria, New South Wales, and Queensland; chiefly a coast species, and on eastern mountain slopes.

30. *Acacia harpophylla*, F. v. M., B.Fl., ii, 389.

The common "BRIGALOW;" so called because it forms the scrubs of that name; the meaning of the word is unknown.

This tree yields a considerable amount of tan-bark of inferior quality. A Queensland correspondent informs me that a sample analysed in London gave 11·59 per cent. of tannic acid.

For a popular account of this too plentiful Queensland wattle, see a paper by the late Rev. J. E. Tenison-Woods, in *Proc. Linn.* Soc., N.S.W., vii, 570.

Central Queensland.

31. *Acacia excelsa*, Benth., B.Fl., 390.

"IRONWOOD," sometimes (though erroneously) called "BRIGALOW." Called "Bunkerman" by the aboriginals of the Cloncurry River, North Queensland.

A Queensland correspondent informs me that a sample of this bark, analysed in London, yielded 16·09 per cent. of tannic acid. It is confined to the northern colony.

32. *Acacia complanata*, A. Cunn., B.Fl., ii, 390.

Dr. T. L. Bancroft has been kind enough to send me some bark of this species from Enoggera, near Brisbane. It yielded 10·28 per cent. of tannic acid, and 31·1 per cent. of extract. It was from a tree 20 ft. in height and 6 in. in diameter. Stripped in May, and analysed in July. It is exceedingly thin (under $\frac{1}{8}$ in. when dry), smooth externally, very fibrous, and apparently of no promise as a tan-bark.

This species is confined to New South Wales and Queensland.

33. *Acacia binervata*, DC., B.Fl., ii, 390.

Illawarra "BLACK WATTLE" or "HICKORY." "Myimbarr" of the aboriginals of Illawarra (New South Wales).

This is a valuable bark; specimens from Cambewarra, N.S.W., yielded me up to 58·03 per cent. of extract, and 30.4 per cent. of tannic acid. The colour of this sample was dark-brown; the inner bark warm red-brown; the outer bark deeply-fissured or flaky, which makes it more or less pulverulent; the inner bark contains abundance of strong fibre; diameter, 12 inches; height, 20 to 25 feet; locally called "Black Wattle." (*Proc. R.S., N.S.W.*, 1887, p. 90.)

A second sample from the same locality gave 28·2 per cent of tannic acid, and yielded 51·5 per cent. of extract.

I have examined a specimen from Tomerong, near Jervis Bay, N.S.W. (between Nowra and Milton), which was collected February, 1888, and and analysed the following September. (*Proc. R.S., N.S.W.*, 1888, p. 273.) As received, it had had its first crushing in the mill, nevertheless it was possible to pick samples showing a fair proportion of inner and outer bark. The outer bark is somewhat scaly, and the inner bark is light reddish-brown and very fibrous. It cannot be mistaken for *A. decurrens* bark owing to its fibrous nature. It gave tannic acid, 19·3 per cent.; extract, 37·8 per cent.

This sample was taken from bulk actually used by a tanner, and it will be found, in general, that barks containing 20 per cent. of tannic acid are commonly used by country tanners; in fact, if bark of a species gives as high as 15 per cent of tannic acid, it is worthy of inquiry whether richer specimens are available.

The above are southern localities, following are from northern:—

Bark from Booral, county of Gloucester, stripped in July, and analysed in August, gave 28 per cent. of tannic acid, and 51·55 per cent. of extract. It was from a tree 30 feet high, and 8 inches in diameter.

Acacia binervata

Illawarra Black Wattle

5a*76–91(e)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

Acacia longifolia

Sydney Golden Wattle

5a* 76-9(6)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

A further sample from Stroud (in the same neighbourhood) collected in January, gave 27·75 per cent. of tannic acid, and 48·9 per cent of extract.

This a coast species of New South Wales and Queensland. It does not extend further south in our Colony than the Ulladulla district. It is frequently a large tree and yields much bark.

Memorandum.—This wattle may be easily recognised by the two prominent veins on the leaf.

34. *Acacia flavescens*, A. Cunn., B.Fl., ii, 391.

This bark contains 10·2 per cent. of tannin. (Staiger.) Queensland.

35. *Acacia longifolia*, Willd., B.Fl., ii, 397.

Sydney, "GOLDEN WATTLE," "White Sallow or Sally," "Hickory," &c.

The bark of this tree is considered in Queensland to be only half as good as that of *A. decurrens*. It is used chiefly for sheepskins. The following is an analysis of this bark:—Tannin, 12·67 per cent.; extract, 32·05 per cent. (Staiger.) A specimen from Cambewarra, N.S.W., yielded the author 18·93 per cent. of tannic acid, and 30·55 per cent. of extract. (*Proc. R.S.,N.S.W.*, 1877, p. 90.) Other specimens (*a*) from Oatley's grant, near Sydney, and (*b*) Ryde, near Sydney, yielded the author (*loc. cit.*, p. 190), 15·34 and 15·99 per cent. of tannic acid respectively, and 24·91 and 23·53 per cent. of extract respectively. Both were from much younger trees than the specimens from Cambewarra.

Speaking generally, this is a smoothish, thin, sub-scaly bark, not in high repute. It yields a light-coloured powder.

A sample from Tantawanglo Mountain, near Candelo, N.S.W., and locally known as "Hickory," was examined by me, and found to contain 5 per cent. of tannic acid, and only 14 per cent. of extract. It was collected in July, 1889, and analysed in April, 1890. It was from trees 20 to 50 feet high, with diameters of 4 to 12 inches, growing on chocolate soil. The trees of this species attain rather large dimensions in this district. The bark becomes coarser and larger, but it is one mass of fibre, and practically useless to the tanner.

South Australia, Tasmania, Victoria, New South Wales, Southern Queensland.

35*a*. The bark of the variety *Sophoræ* is used for tanning light skins in Queensland, but as it is comparatively weak in tannin it fetches but a low price. It is there called "Black Wattle." (Bailey.) Mr. W. Adam informs me that Sydney fishermen often tan their sails and nets with this bark, and are well pleased with it, the articles being pliable after use.

35*b*. A second variety of *A. longifolia*, *viz.*, *floribunda*, obtained from Cambewarra in August, 1886, yielded the following result in April, 1890:—Tannic acid, 6·09 per cent.; extract, 14·95 per cent. It was from trees 20 to 50 feet high, locally known as "Sally," or "Sallow." The bark is very like that of the normal species, but from an older tree, and also full of fibre. A specimen of "Sally" from Bolong Swamp, Nowra, collected in July, 1888, and analysed also in April, 1890, gave only 2·54 per cent. of tannic acid, with 13·07 per cent. of extract. It is a useless, fibrous bark, yielding a substance like chopped grass when passed through the mill. It was from trees 20 to 40 feet high, with diameter of 6 to 18 inches, and grown on alluvial soil which the species in general usually favours.

36. *Acacia aneura*, F. v. M., B.Fl., ii, 402.

"MULGA." The chief ingredient of Mulga scrub, so called from the Mulga, or long, narrow shield of wood made by the aboriginals out of Acacia wood.

A specimen of the bark of this tree from Ivanhoe, *via* Hay, N.S.W., yielded 4·78 per cent. of tannic acid, and 10 per cent. of extract. A narrow-leaved variety from the same neighbourhood yielded 20·72 per cent. of extract, and 8·62 per cent. of tannic acid. The former is a deeply-furrowed, flaky, pulverulent bark, apparently from an old tree; average thickness, $\frac{3}{8}$ inch. The bark of the narrow-leaved variety is a thin, poor bark, not exceeding $\frac{3}{16}$ inch in thickness, moderately fissured, of a dark-grey colour, sometimes nearly black. (*Proc. R.S., N.S.W.*, 1887, p. 32.)

A second sample of the normal species gave (*Proc. R.S., N.S.W.*, 1888, p. 271), 2·32 per cent. of tannic acid, and 12·12 per cent. of extract. It was from Tarella, Wilcannia; collected August, 1887; analysed August 1888. A useless, flaky, dry-country bark.

An inland, desert species, found in all the colonies except Tasmania.

37. *Acacia glaucescens*, Willd., B.Fl., ii, 91.

A "MYALL" and "BOREE" of Southern N.S.W. Called also "BRIGALOW," "ROSEWOOD," &c.

Bark from near Bombala, N.S.W., yielded 8·10 per cent. of tannic acid, and 14·29 per cent. of extract. (*Proc., R.S., N.S.W.*, 1887, p. 91.) It was locally termed "Myall," and was grown on limestone. Height, 20 to 25 feet; diameter, 6 to 12 inches. A deeply fissured bark of a dark-grey colour. I would like to get better samples of this bark.

From Victoria to Queensland; a favourite situation being high river banks amongst rocks.

38. *Acacia Cunninghamii*, Hook., B.Fl., ii, 407.

"BLACK WATTLE," "BASTARD MYALL" of Northern New South Wales.
"KOWARKUL" of the Queensland aboriginals.

A specimen of this bark received from Dr. T. L. Bancroft, of Brisbane, and obtained from Deception Bay, gave 12·32 per cent. of tannic acid and 26·95 per cent. of extract. It is known locally as "Black Wattle." It was from a tree 30 feet in height and 1 foot in diameter, stripped in May, analysed in July. Dr. Bancroft says, "This is the only tanning wattle which grows near Brisbane in any great abundance."

The inner bark consists largely of fibre, while the outer is furrowed and scaly, of a dark-brown colour; the thickness of the bark analysed averaged ½ inch under the outer scaly portion. The colour is dark-reddish brown, and altogether it looks a poor tan bark. As a rule this tree carries a heavyish bark.

Following is an analysis of another Queensland sample of this bark:—Tannin, 9·13 per cent.; extract, 16·15 per cent. (*Queensland Comm., Col. and Indian Exh.*, 1886.)

Central New South Wales to Central Queensland,

39. *Acacia leptocarpa*, A. Cunn., B.Fl., ii, 407.

The following is an analysis of this bark:—Tannin, 10·20 per cent.; extract, 26·41 per cent. (Staiger.)

Queensland.

40. *Acacia polystachya*, A. Cunn., B.Fl., ii, 407.

This bark contains 7·59 per cent. of tannin. (Staiger.)

Queensland and Northern Australia.

41. *Acacia aulacocarpa*, A. Cunn., B.Fl., ii, 410.

"HICKORY WATTLE." (Bailey.) "Dilka" of the Port Curtis blacks. (Hedley.)

This tree yields a tan-bark, used in Queensland to some extent. A specimen received from Dr. T. L. Bancroft, who obtained it from Deception Bay, near Brisbane, gave 7·34 per cent. of tannic acid, and 13·9 per cent. of extract. Height of tree 30 feet; diameter, 1 foot, stripped in May, analysed in July. Locally, it is a very common species.

The bark analysed had an average thickness of ⅜ inch.; the interior consists largely of yellowish fibre, while the exterior is greyish, deeply

furrowed, and consists of large flakes useless for tanning purposes. It, however, cuts solid, and its general appearance would lead one to suppose that it is richer than it is.

Central and Northern Queensland.

42. *Acacia elata*, A. Cunn., B.Fl., ii, 413.

A "MOUNTAIN HICKORY."

I am informed that this species is known as "black wattle," in the Kurrajong district.

It looks strikingly like the frequently cultivated pepper-tree (*Schinus molle*), as regards its foliage and habit. It is one of the most beautiful of the arboreous Acacias, and it frequently attains a large size, *e.g.*, a correspondent of mine obtained fifteen 4-bushel sacks of bark from one tree.

A specimen of bark of this tree was analysed (*Proc. R.S., N.S.W.*, 1888, p. 271), and yielded 20·11 per cent. of tannic acid, and 36·2 per cent. of extract. Height, 50 feet; diameter, 8 inches. Flaky and somewhat rugged on the outside, but often blackish, and stained with lichens, on account of its habitat (gullies). This sample reminds one of that of *A. decurrens* when young. This is a tree of local distribution, and were it more abundant it would come into notice as a tanner's bark, since the sample examined (obtained from Springwood, Blue Mountains), was hardly up to the average quality obtainable.

Two samples of this bark were received at the Technological Museum May, 1890, from Kanimbla Valley, Blue Mountains; one from a large tree 30 to 50 feet high, diameter, 15 inches; the other from a small tree.

The bark of the larger tree contained much scaly material on the outside of a dark-brown colour, which, being deficient in tannic acid, detracts from the value of the bark. The thickness of this bark is 1 inch, half of which represents the inner bark, which is fibrous, very astringent, and of a light colour. Analysis of this bark (a fair section of outer and inner, being taken), was made in June, 1890, and it was found to contain 28·5 per cent. of tannic acid, and 51·15 per cent. of extract. The liquor is of too dark a colour to be first-class, but would be improved by removing the outer scaly bark before grinding, if that were possible.

The bark from the younger tree was solid, slightly scaly on the outside, and ¼ inch in thickness. When powdered, it was hardly to be distinguished from some specimens of *decurrens* bark, being light coloured, and altogether a promising bark. Analysis shows this to contain 31·1 per cent. of tannic acid, and 55·35 per cent. of extract.

Acacia elata

A Hickory

5a*76-31(b)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

Acacia decurrens

Black Wattle

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

A specimen from Robertson, about 20 miles from Mittagong, stripped in January, yielded 28 per cent. of tannic acid, and 49·75 per cent. of extract. This also gave a light-coloured liquor. It is a ¼ of an inch thick without the scaly exterior; the bark is pale-coloured, and worthy of some attention, although it is inclined to be fibrous.

Found on the Blue Mountains and its spurs (chiefly in gullies and along water-courses), and in mountainous country no great distance south of Sydney, *e.g.*, West Bargo gullies, Picton, Mittagong, &c.

43. *Acacia pruinosa*, A. Cunn., B.Fl., ii, 413.

A sample obtained, May, 1890, from Kincumber, near Gosford, New South Wales, from a largish tree, was barely ⅛ inch thick when green, and this, of course, would diminish on drying; this specimen was analysed June, 1890, and was found to contain 24·25 per cent. of tannic acid, and 49·75 per cent. of extract, so that it is not a worthless species as is often supposed. It would come in Class B. This yields a thin greyish bark, containing little fibre; it powders well, and might easily be mistaken for a bark of superior quality. The yield would not be large even from good sized trees, as the bark is too thin.

This wattle is abundant in the neighbourhood of Gosford, New South Wales, where it attains a large size. It is, however, rather weak in tannic acid, and a mill may be seen falling into decay, because *after* the plant was erected the owner found that the bark would not pay to convey far. From superficial knowledge he might have jumped to the the conclusion that the tree was *A. decurrens*, but the fact remains that a man was foolish enough to expend a fair amount of capital without the trouble to make sure he had suitable bark.

A very fine sample of this bark from Cooranbong, near Morrissett, Northern line, gave 23 per cent. of tannic acid, and 46·25 per cent. of extract. These two analyses may be assumed to fix the value of this bark.

New South Wales and Queensland. Its southern limit appears to be the Brogo River, near Bega.

44 *Acacia decurrens*, Willd., B.Fl., ii, 214.

[For a discussion of the names, characteristics, localities, &c., of the numerous varities of this best-known species of all Australian Wattles, the reader is referred to *Appendix* ii, page 67].

A. decurrens is an important tan-bark in most of the colonies, and as the tree grows in the poorest soils, every encouragement should be given to its cultivation. This wattle and the South Australian *A. pycnantha* will

supplement each other, the former flourishing in situations too damp and cold for the latter. Varieties of *A. decurrens* are at present abundant on some Crown and other lands in various districts of the Colony, were thousands, and perhaps millions, of seedlings may be sometimes seen, forming a dense, useless brush, liable to destruction by bush fires. In these localities we do not require to sow seed, but to use the tomahawk. They should be thinned out freely, to admit light and air to the most promising seedlings, which will then have some chance of forming trees capable of carrying a merchantable amount of bark.

In many places selectors wage war against this tree, simply looking upon it as a troublesome weed. They should try the thinning process, leaving the most shapely trees. They will find that wattle scrub (of the right kinds), will become of value, instead of a nuisance.

Mr. J. E. Brown states that in South Australia this species is much less hardy than *A. pycnantha*, but in other colonies this is not the general experience. Baron Mueller recommends planting of *A. decurrens* in worn-out lands overrun with sorrel. It is fond of moisture, and not of too much heat. The Baron also gives its rate of growth as about 1 inch in diameter every year. Mr. J. E. Brown mentions some trees in South Australia 30 feet high and 8 inches in diameter, only five years of age, and I can record similar experience near Sydney. It is rather liable to attacks by borers, but this subject will be dealt with in a supplement to this work.

It is a useful tree for making a quick-growing shelter for vineyards, orchards, &c.

We now proceed to discuss the varieties in detail; the botany of the subject being dealt with in *Appendix* ii.

44 (*a.*) *Acacia decurrens* (normal variety).

"SYDNEY BLACK WATTLE."

[Memorandum: In the Sydney district people are not always unanimous in the use of the terms, "Black and Green Wattle," as applied to the *normal* and *mollis* varieties of *Acacia decurrens*].

Acacia decurrens, var. *normalis*. B.*

SYNONYMS AND LOCAL NAMES.

A. decurrens (1.)—The "Black Wattle" of the Sydney district. "Sydney Wattle" (1.) Formerly known as "Book-kerriking" by the aboriginals of the counties of Cumberland and Camden (Macarthur).

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* For the key to these abbreviations see page 68.

LOCALITIES.

New South Wales.—Apparently confined to this Colony, and restricted to the neighbourhood of Sydney, *i.e.*, a few miles to the north, and less than 100 miles to the south.

A coast variety, chiefly about Port Jackson (B.), Campbelltown, Berrima district, Picton, and Bargo Brush.

A not very good specimen from Campbelltown, stripped in August, yielded 31·5 per cent. of tannic acid, and 57·35 per cent. of extract.

A specimen from Ryde, near Sydney, yielded 32·33 per cent. of tannic acid, and 48·74 per cent. of extract. (*Proc. R.S., N.S.W.*, 1887, p. 93.)

44. (*b.*) *Acacia decurrens* (*mollis* variety, often known as *Acacia mollissima*). *Acacia decurrens*, var. *mollis* (B), (2). *A. mollissima* (I), (3).

LOCAL NAMES.

Sometimes called "Black Wattle" in New South Wales, and commonly so called in Victoria and Tasmania, but usually called "Green Wattle" in New South Wales, and occasionally "Silver Wattle." Formerly called "Wat-tah" by the aboriginals of the counties of Cumberland and Camden, New South Wales (Macarthur); "Garrong" of some aboriginals of Victoria, and "Warraworup" by those at the aboriginal station, Coranderrk, Victoria.

LOCALITIES.

The only form in Tasmania, and the most common one in Victoria; less frequent in the northern districts of New South Wales. (B.)

New South Wales.—Barber's Creek, Sydney, Marulan, Wagga, Araluen, Eden, Gosford, Greta (near Newcastle), Wallsend, Booral, Port Stephens.

See also localities of barks analysed.

[Widely distributed throughout the Colony, but stunted in the dry country.]

Queensland.—Inland, extra tropical Queensland. (2.)

Victoria.—Widely distributed.

Tasmania.—Widely distributed.

South Australia.—South of the Murray Desert, embracing the 90-mile Desert and the Tatiara, Mount Gambier District. (3.)

I now proceed to give brief descriptions, with analyses, of illustrative samples of this bark, and for practical convenience I divide those of New South Wales into southern and northern localities, taking the Hawkesbury River as a natural boundary.

Southern Barks.

A sample of a smooth green bark from a young tree afforded 33·5 per cent. of tannic acid, and 61·85 per cent. of extract; while a second sample, from an older tree, gave 35·3 per cent. of tannic acid, and 59·05 per cent. of extract. Both were grown near Penrith, New South Wales.

A black bark, slightly rugged, from Mulgoa, Penrith, gave 35·56 per cent. of tannic acid, and 59·2 per cent of extract. It was known locally as "Green Wattle."

A sample received May, 1890, and analysed the following month, was found to contain 34·85 per cent. of tannic acid and 61·5 of extract. It came from Burragorang. It is thicker than most barks of this species, and is beginning to be scaly on the outside. Were it not for that defect it would be a splendid bark. It was allowed to remain a year too long on the tree, a fault not usually to be found with bark getters.

Another sample taken from a tree between 40 and 50 feet high and 15 inches in diameter, at a place 12 miles from Burragorang Mountain, where this species was growing in very large quantities, was analysed July, 1890, and found to contain 34·4 per cent. of tannic acid, and 69·33 per cent. of extract. This is a perfect specimen of bark of this species, being of good thickness, smooth, and of good colour.

A sample from Cambewarra, from trees 20 to 30 feet in height, and 6 to 8 inches in diameter, gathered in August, 1886, was found to contain 32·08 per cent. of tannic acid, and 52·16 per cent. of extract. (*Proc. R.S., N.S.W.*, 1887, p. 33). A bark grown in the same neighbourhood, and analysed in April, 1890, gave only 24·13 per cent. of tannic acid, and 47·1 per cent. of extract. It is a smooth bark, but from a young tree, being only $\frac{1}{8}$ of an inch thick, and rather fibrous. Had been allowed to remain on the tree a couple of years longer, I feel sure that the percentage of tannic acid would have much increased.

A sample from Nerriga (on the high table-land from Nowra to Braidwood), gave the excellent result of 36·3 per cent. of tannic acid, with 62·54 per cent. of extract. (*Proc. R.S., N.S.W.*, 1888, p. 271). Height of tree, 15 to 20 feet; diameter, 8 to 12 inches. It was stripped in January, and

analysed the following August. This is the best sample of *A. decurrens* bark which has hitherto been examined by me.

A second sample from the same district yielded 31·75 per cent. of tannic acid, and 62·35 per cent. of extract; while a third gave 29·25 per cent. of tannic acid, and 59 per cent. of extract. A fourth gave 24·99 per cent. of tannic acid, and 53·96 per cent. of extract.

A bark from Bateman's Bay, collected in February, and said to be known locally as "Silver Wattle,"* yielded the very satisfactory result of 34 per cent. of tannic acid, and 59·45 per cent. of extract. It was obtained from trees 50 feet high and 9 inches in diameter.

A second specimen from the same locality, collected at the same time, and labelled, probably more correctly, "Green Wattle," gave the even better result of 36·25 per cent. of tannic acid, and 60·3 per cent. of extract. It is as good as any Victorian or Tasmanian.

Mr. Thomas Shepherd, an enterprising tanner of Cambewarra, has kindly furnished me with the following information in sending the first sample from Nerriga. Of all New South Wales localities he prefers Nerriga for *A. decurrens* bark. He says it would be quite equal to Tasmanian if it could be obtained as finely ground. From Cambewarra bark Mr. Shepherd obtains only two liquors, of which the second is very weak, while from the Nerriga bark he invariably obtains three strong liquors. In his opinion the best time for stripping is when the trees are in bud, and have just come into flower. Next to the Nerriga bark he speaks highest of that coming from the Bega district.

I have examined a sample of bark called "Green Wattle," from Bell's Creek, Araluen, N.S.W. It was from trees 25 to 30 feet high, with diameters from 6 to 18 inches, was grown on granite soil, and was collected in November, 1888. In April, 1890, it was analysed with the following result:—Tannic acid, 31·23 per cent.; extract, 64·15 per cent. It is smooth, compact, yields a light-coloured powder with some fibre, is a quarter of an inch thick, and is to be ranked with the best of our New South Wales barks.

Bark from Eden, stripped in November, gave 30·25 per cent. of tannic acid, and 51·65 per cent. of extract.

A specimen of "Green Wattle-bark," grown at Tombong, Snowy River, N.S.W., was collected in March, 1889. It was obtained from trees 20 to 33

*Probably this incorrect name was given owing to an abnormal whiteness of the trunk, caused by lichens.

feet high, with diameters 6 to 15 inches, and was grown in granite country. It yielded (April, 1890) 24·63 per cent. of tannic acid, with 45·8 per cent. of extract. This sample is hardly fair to the species. It is rather thin, rugged, covered with lichens, and rather more fibrous than the generality of barks of this variety. In spite of the badly selected sample, the analysis shows that it is full of promise.

Northern Barks.

Bark from Booral, stripped in June, yielded 28·52 per cent. of tannic acid, and 56·1 per cent. of extract. A second sample from the same place, gave 27·5 per cent. of tannic acid, and 57·1 per cent. of extract.

A sample from Raymond Terrace, collected in December, gave 33·20 per cent. of tannic acid, and 56·5 per cent. of extract, showing that good barks can come from the north.

Bark from Gosford, stripped in July, from four year old trees, gave 22 per cent. of tannic acid, and 46·4 per cent. of extract.

We now turn to the other Colonies. Following are two barks from Casterton, Victoria, stripped in January, and analysed in the following March. A picked specimen, said to be the best obtainable, gave the excellent result of 36·25 per cent. of tannic acid, and 61·65 per cent. of extract, practically the same as that of the Nerriga, New South Wales, bark, already noted.

A second specimen of the same district, sent as an average sample, gave 29 per cent. of tannic acid, and 54·45 per cent. of extract.

The following analysis of a Queensland sample, was given by the Commissioners of that Colony at the Colonial and Indian Exhibition of 1886:—Tannic, 15·08 per cent.; extract, 26·78 per cent. This bark becomes undoubtedly inferior in the warmer climate of Queensland.

This variety is commercially the most important of the *decurrens* group, partly on account of its extended geographical distribution, and partly because of the great sizes the trees frequently attain.

The Victorian tanners prefer the Portland* bark to all others. The best New South Wales bark comes from the South Coast.

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*Mr. James Nolan, of Casterton, Victoria, writes:—"This is about the centre of a very good wattle district, the bark fetching the highest price in the Melbourne market, where it is known as Portland ground. Portland is the nearest market, and draws its principal supplies from about here. Our bark beats Tasmanian by about £1 per ton.

(*c.*) *Acacia decurrens*, var. *Leichhardtii.*

A "GREEN WATTLE."

A. decurrens, var. *Leichhardtii* (B), (2).

Acacia mollissima, Willd., var. *Leichhardtii.* F. v. M. (ined).

LOCALITIES.

Queensland.—Between Archer's Station and Biron and towards the Bunya, Leichhardt (B).; Maroochie, Bunya Mountains (2).

New South Wales.—Mogo, Moruya, Nelligen, Bateman's Bay. Found also in the Monaro and Braidwood districts and in the Jingera Mountains.

The bark of this variety is used by the local tanners, and is spoken of fairly well as regards percentage of tannin, but is not much liked on account of its being considered too hard and fibrous, and therefore difficult to break up in the mill.

It is a common belief amongst tanners (and at present I am not prepared to say what basis of truth it has, that barks much subjected to frost and snow are much richer in tannin than those not so subjected. The present sample is from a tree grown in a very cold district. It was collected October, 1888, at Monga, from trees 20 to 25 feet high, and 6 to 18 inches in diameter growing on granite soil. Thickness of bark about $\frac{3}{16}$-inch. A smoothish bark of a light colour, but forming a rather fibrous powder. It was analysed April, 1890, and found to contain 26·4 per cent. of tannic acid, and 45·25 per cent. of extract.

This variety would appear to attain exceptional dimensions at Yalwal, not far from Nowra, as I have been informed that trees in that locality have been stripped of the following diameters, viz.:—9, 12, 18, and 36 inches. The last diameter is certainly extraordinary, and I have not heard of authentic measurements of any variety of *Acacia decurrens* giving over 24 to 30 inches, and then only in exceptionally favourable localities; but my information appears to be quite reliable, and I have heard from another source of the immense size of the trees in this locality. The bark is no less than 1 inch thick and must have come from a huge wattle. It is scaly on the outside and reminds one of mountain hickory bark (*A. penninervis*). It was stripped in March and analysed the same month, with the result of 29·25 per cent. of tannic acid and 46·75 per cent. of extract. A second specimen from a tree 18 inches in diameter gave 25·75 per cent. of tannic acid and 40·8 per cent. of extract. A third specimen from a tree 9 inches in diameter gave 26 per cent. of tannic acid and 44·05 per cent. of extract.

44. *(d). Acacia decurrens*, var. *pauciglandulosa.*

A "GREEN WATTLE."

Var. *pauciglandulosa* (B) (2).

Localities.

New South Wales.—New England, Clarence and Hastings Rivers (B), Bateman's Bay, Bolivia, Hunter River, Port Stephens, Tenterfield.

Queensland.—Moreton Bay, &c.; also between Archer's and M'Kenzies' stations, in moist places; Leichhardt (B); Coast, extra-tropical; Queensland (2); Tewantin.

A poor, thin, too-early stripped specimen from Tewantin, Queensland, stripped in July and analysed in September, gave 22·1 per cent. of tannic acid and 41·6 per cent. of extract.

One from Port Stephens, New South Wales, stripped in December, yielded 31·75 per cent. of tannic acid and 51·55 per cent. of extract.

A third sample from Bateman's Bay, New South Wales, stripped in February from trees 30 feet high and up to 15 inches in diameter, gave the result of 27 per cent. of tannic acid and 53·45 per cent. of extract.

Cultural Notes.

The following notes are, as a rule, directly based upon observation with the *mollis* variety of *Acacia decurrens*, but more or less applicable to all varieties of *decurrens*.

Mr. Evan Francis writes:—"In a garden in Bega, a few years ago, I sowed seeds of black wattle on September 1st, and on the 1st January, following, plants were measured 11 and 12 feet high: this, for four months, was enormous growth."

Following is an account by a New Zealand correspondent (Waikato, Auckland), of his experience in regard to this variety, which may be useful for the guidance of others in similar localities:—

"I have about 5 or 6 acres of *mollissima*. I got the seed from Tasmania. They are growing the best of any I have got. They do not make much tap root; they spread the roots near the surface. They were sown two years ago last month (September), and some of them are 12 feet high, without any shelter. They are the best to remove. I planted an acre with young trees taken out of them twelve months since last March. I took them without any soil, and there is not one dozen in the whole lot that have died; but I find that after you plant any of the Acacia tribe, they do not

commence to grow till twelve months after they are planted. I have no doubt that they will grow much better under the bamboo system."

In another letter my correspondent says:—"Trees four years old are 25 to 28 feet high, and 5 inches in diameter at 3 feet from the ground. They had no shelter."

The following interesting observations of Mr. William Bäuerlen are instructive, as showing the advantages of cultivating natural seedlings of wattle, instead of allowing them to take their chance—in other words, they are responsive to any attention. At the same time, this method is most successful in rainy rather cold districts:—

Major's Creek, near Araluen, New South Wales, planted green wattles from seedlings in August, from 12 to 15 inches high.

		Height.	Girth.
6 years old ...	1 ...	25 ft. ...	30 in., 3 ft. above ground.
„ ...	2 ...	28 „ ...	24 „
„ ...	3 ...	21 „ ...	21 „
4 years old ...	1 ...	20 „ ...	24 „
„ ...	2 ...	18 „ ...	20 „
2 years old ...	1 ...	15 „ ...	11 „

None of the wattles from the place from which these were taken for planting (and some even exceed six years in age), exceed 15 feet in height, and 10 inches in girth.

In the same locality, there is a tree ten years old, which is 30 feet in height, and has a girth of 3 feet 7 inches. The tree is remarkably straight and healthy, the bark on the trunk having quite a smooth young appearance yet. A tree of the same dimensions out in the bush would have a dark, rough, furrowed bark, and would doubtless be twice the age.

Mr. Evan Francis, when at Bega, also experimented with bush seedlings, and this is what he says:—

"In six months the trees ranged from 10 to 15 feet in height. The taller trees were in the more sheltered positions. Single specimens in open ground did not succeed half as well as those in the centre of the grove, where they were mutually sheltered. A distance of 9 feet, plant from plant, seemed the correct thing.

"At two years the trees were fine saplings of about on an average 20 to 25 feet high. We estimated that a yield of from 30 to 40 lb. of dry bark would be given by these trees at four years old, but they reached their prime at six years, when the bark at the lower parts of the trees had great substance, and the yield of dry bark would be fully 60 lb.; and I am sure selected trees would have reached 100 lb."

45. *Acacia dealbata*, Link, B.Fl., iii, 415.

"SILVER WATTLE."

Some specimens from Quiedong, Bombala, N.S.W., yielded the author 21·22 per cent. of tannic acid and 39·86 per cent. of extract. They were from trees 12 to 18 inches in diameter and 20 to 30 feet high, and were grown on limestone country (*Proc. R. S., N.S.W.*, 1887, p. 92). A second sample from the same district gave 17·1 per cent. of tannic acid and 39·3 per cent. of extract. These samples bear a general appearance to *A. decurrens* bark, but they are much more rugged, and apparently from an old tree. The barks form a rather fibrous powder. The whitish external layer common in this species is almost absent.

I have examined a sample from the Delegate River, N.S.W., where the trees are growing in the brush (rich jungle), in chocolate soil, attaining a height of 60 to 100 feet, with a diameter of 1 to 2 feet. Bark collected in April 1889, yielded the following April, 25·9 per cent. of tannic acid and 45·7 per cent. of extract. This has the general appearance of *A. decurrens* bark, but is in layers, separable with a little difficulty, more fibrous, and has the appearance of having been dusted on the outside with a white powder. The whitish appearance does not rub off, and the stem looks as if it had had a coat of lime wash. It is the work of a lichen.

A perfectly smooth, thin, silvery or ash-grey bark, from near Penrith, N.S.W., gave 24·13 per cent. of tannic acid and 47·85 per cent. of extract.

Barks received from Mr. C. Brownrigg, gathered in June, and obtained from parish of Beaufort, Cowra district, diameter of tree 10 inches, yielded 16·5 per cent. of tannic acid and 42·4 per cent. of extract. A second sample from the parish of Calout, in the same district, from a tree 7 inches in diameter, gave 20·3 per cent. of tannic acid with 43 per cent. of extract. Mr. Brownrigg kindly furnished the following notes with these samples:— *Beaufort sample*—"Extensive forests of good, sound, old, and young trees, not affected by the ring-barking of other timber." *Calout sample*—"Since the ring-barking of the box and other timber, nearly all the old wattle trees have died away; a young forest appears to be growing up."

Bark from county Auckland (Monaro), and stripped in November, gave 24 per cent. of tannic acid and 42·55 per cent. of extract.

Two samples from the Cooma district gave 24 per cent. of tannic acid with 49·6 per cent. of extract, and 25·5 per cent. of tannic acid with 51·2 per cent. of extract, respectively. The latter bark is worthy of special mention. It is quite black, having not a trace of the whitish appearance generally found on the bark of this species. It was brought to me as Green wattle (*Acacia decurrens* var. *mollis*), and there seemed no necessity to doubt the

diagnosis. No expert could have told the difference between it and Green wattle if he had not been permitted to test it. It is a good instance of the deceptiveness of appearances.

"Silver Wattle" bark may be assumed to contain about 25 per cent. of tannic acid in the best samples.

In Tasmania it has often been recommended the destruction of these trees in order to let *A. mollissima* grow, and this advice is probably sound, but only in cases in which one or other has to be sacrificed.

I think I have adduced sufficient evidence to convince intelligent people that the bark is by no means a worthless one, and barks inferior even to this are locally used in districts not favoured with the alternative of the use of such a bark as *decurrens*. I hope that barks in a particular district will be tried on their merits, and not be condemned without trial.

In insisting on the general principle of assay of barks, just as a man engaged in the mining industry is always careful to sample his stone as occasions require, I am quite aware of the special circumstances of Tasmania as regards the "Silver Wattle," and that the case in that colony against this particular species is stronger than it is in our own. In Tasmania the "Silver Wattle" grows more in spars than with us; its bark has a more than ordinary tendency to shrink; it is tough and fibrous (though not to such an extent as *A. binervata*, for instance). As wattles take longer to mature in Tasmania than with us, it will be quite understood that I am in no way reflecting on the wisdom of the advice of letting the cultivation of the best species remain unimpeded.

I understand that the "Silver Wattle" forests in the southern portion of this Colony are now being exploited for the English market.

A New Zealand (Auckland) correspondent states that his four-year old *dealbata* trees are 35 ft. high in a sheltered place, with a diameter of 4 to 8 in. at 3 ft. from the ground. They grow quicker than *decurrens* in his particular district. *Acacia dealbata* is not indigenous in New Zealand (nor is, in fact any *Acacia*), and it is a pity that this species has been introduced into that Colony for its yield of tan-bark, as I understand, has been done in several instances, whether deliberately, or by a mistake in seed, I am unable to say.

The "Silver Wattle" sometimes obtains an enormous size in Tasmania, Victoria, and Southern New South Wales. In Tasmania, Backhouse measured a tree 11 ft. 2 in. in girth, and "Silver Wattles" approaching 100 ft. in height have frequently been found in all three colonies.

This species is found in Tasmania, Victoria, New South Wales, and Queensland. It is chiefly a mountain species.

Appendix I.

BOTANICAL NOTES ON THE GENUS *ACACIA*.

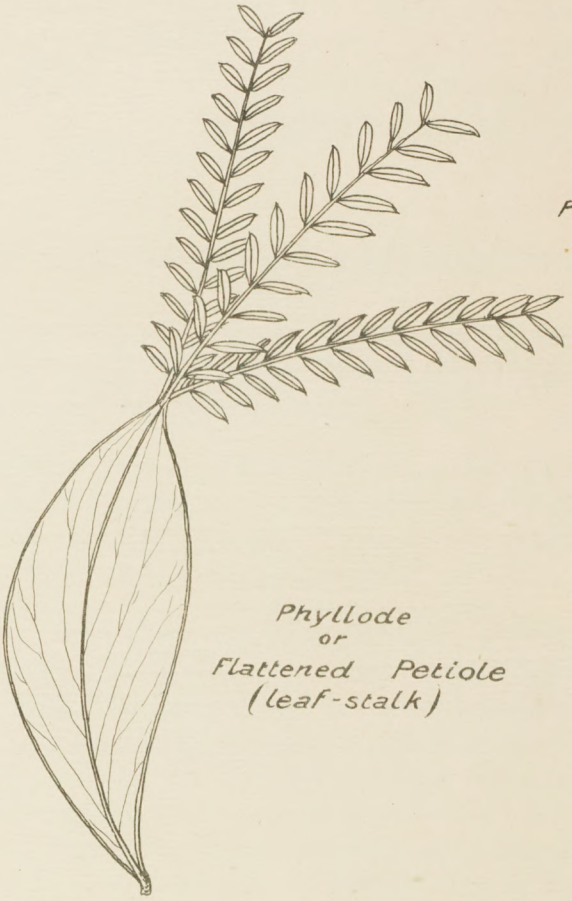
The following elementary botanical notes are given in the hope that they may be of some little use to country residents in their studies in regard to this important group of trees.

The word *Acacia* is derived from the Greek, and denotes a thorny plant, and was given to this genus on account of so many of the species being spinescent. It was originally applied by the ancient naturalist Dioscorides to a North African shrub yielding a gum-arabic.

The leaves of most Australian *Acacias* are structurally simply an expansion or flattening out of the petiole or leaf stalk. Such "leaves" are known as *phyllodes*. *Phyllodinous Acacias* have true leaves when they are very young seedlings, and some species belonging to the same category also have a greater or less tendency to the formation both of true leaves and *phyllodes*. This variation appears often to puzzle beginners in wattle growing. For example, *Acacia pycnantha* produces pinnate leaves in the seedling state, and I have received complaints such as the following:—"The seeds sent as *pycnantha* are coming up *decurrens*." Again, people accustomed to *decurrens* want reminding that there are wattles with other kinds of foliage. Here are the exact words of an anxious correspondent, and doubtless others have felt the same difficulty. I may mention that a trial package of *pycnantha* seed had been sent to him.

"I planted the seed according to directions; they duly germinated; when about two inches high the wattle leaves appeared to merge into gum leaves (*phyllodes*, J.H.M.), at the upper ends of which wattle leaves afterwards sprang out, and now many of the plants look more like young gum trees than wattle trees.

"Would you kindly inform me if this is the manner in which the true South Australian wattle grows, or have the plants I have raised become inoculated?"



Diagram

to show

Metamorphosis of Wattle leaves

(5a* 76–91(K))

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

The whole family of Acacias is divided into two main groups, according to the structure of their leaves :—

1. *Phyllodineæ.*—Those which have the true leaves* replaced by *phyllodes.* The first leaves put forth will be found to be compound, consisting of several leaflets succeeding each other on each side of the midrib or petiole, and being compared to the branches of a feather, have received the name of pinnæ, and the whole said to be pinnate.

The diagram herewith will, perhaps, make the matter of *Acacia phyllodes* more clear. I may mention that the metamorphosis described is characteristic of nearly 280 out of about 300 known species of this genus.

2. *Bipinnatæ.*—Under this heading are included the *Acacias* which never develop *Phyllodes,* but bear true leaves through all stages of growth.

Appendix II.

THE *ACACIA DECURRENS* GROUP OF WATTLES.

The well-known feathery-leaved wattle, familiar to most people in the eastern and southern colonies,—by whom it is chiefly known by one of two names, viz., black or green wattle—was first botanically described by the botanist Willdenow, who defined two species, *Acacia decurrens* and *Acacia mollissima.*

In the Flora Australiensis, Bentham took Willdenow's *decurrens* as the typical species, reducing the other species to the rank of a variety under the name of *mollis* ; in other words, *Acacia mollissima,* Willd., is *Acacia decurrens,* Willd. var. *mollis,* Benth. Bentham also called another variety *normalis,* a third one *pauciglandulosa,* and a fourth (doubtfully) *Leichhardtii.*

Many years afterwards, Baron von Mueller decided to again raise the *mollis* variety to the rank of a species, re-introducing Willdenow's name—*mollissima*—for it. Thus, according to the learned Baron, we have two

---

* To speak more precisely, phyllodes in reality formed by the confluence of leaflets, stalklets, and stalks.

species, *Acacia decurrens* and *Acacia mollissima*. But, for botanical as well as for practical purposes, I have (after most careful and prolonged investigation), come to the conclusion that Bentham's arrangement is the more satisfactory one. However, inasmuch as by holding this opinion I differ from the eminent Australian botanist, I proceed to give a full account of the reasons which have caused me to arrive at the conclusion.

There are four varieties whose typical forms (with the exception of *Leichhardtii*) appear to be more or less well defined; but, after examination of some hundreds of specimens, I incline to the opinion that they all pass into one another, and the *mollis* variety (in my view) has no more claim to specific rank than has *pauciglandulosa*.

In stating this, I am aware I am but endorsing Bentham's words:—"The following forms appear at first sight very distinct, but pass into each other by many gradations."

Following are the points, stated briefly, on which I base my opinion:—

1st. The pinnules of all vary more or less in each variety in length, breadth, and insertion.

2nd. A decurrence of leaf stalks is common to all.

3rd. Nothing is constant in times of flowering.

4th. The indumentum is variable in three varieties.

5th. The yield of tannic acid in the bark is the same in each.

6th. Seed. The microscope fails to detect any marked difference in these four varieties.

7th. Number of glands vary in each variety in the same tree.

However, in the following table I have tried to *accentuate* the differences between the various varieties, although it is often difficult to find any which are approximately constant.

Authorities Quoted.

(B.) Bentham. Flora Australiensis ii, 414–5.

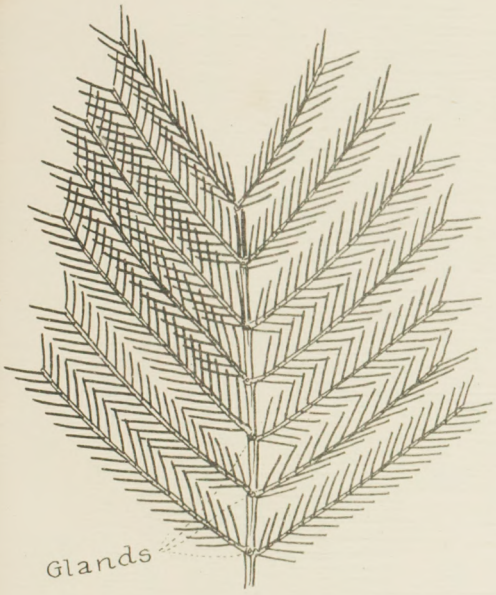
(1.) Dichotomous Key to the System of Victorian plants (Mueller), 1887–8, i. 199.

(2.) Synopsis of the Queensland Flora. F. M. Bailey, 1883, p. 144.

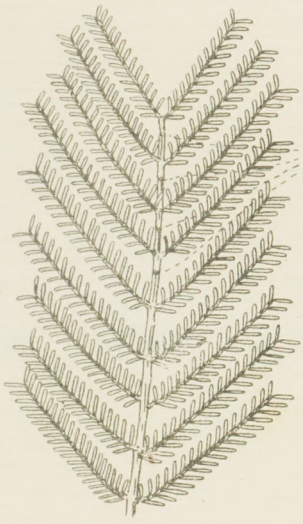
(3.) Handbook of the Flora of extra-tropical South Australia, 1890. Tate.

ACACIA DECURRENS (Willd).	Variety—*NORMALIS.*	Variety—*MOLLIS.*	Variety—*LEICHHARDTII.*	Variety—*PAUCIGLANDULOSA.*
A handsome tree, glabrous, or more or less tomentose - pubescent. (B), *et seq.*	The foliage is more sparse, *i.e.*, less compact and umbrageous than *mollis!* Glabrous, or the young shoots, slightly tomentose - pubescent (B), foliage scantily beset with hairlets (1).	Foliage softly tomentose-pubescent, the indumentum assuming a golden yellow tinge on the young shoots (B); foliage at first yellowish, soon greyish from subtle vestiture (1).	More or less hirsute, with spreading hairs (B).	Pubescent, but not so softly so as in the var. *mollis*, and sometimes also hirsute with the same golden - yellow tinge in the young shoots (B). Often scabrous! The yellowish tinge deepest in this variety might be termed old gold!
Branches more or less prominently angled, sometimes almost winged.	Decurrent angles from the base of the leaf-stalks along the branchlets *extremely* prominent (1)!	Decurrent angles from the leafstalks, *somewhat* prominent (1). All stages of angularity, but never so marked as in *normalis!*	Same remarks as *mollis.*	Same remarks as *mollis.*
Pinnæ, 8-15 pairs, or sometimes even more, rarely reduced to 5 or 6.	Usually 7-13 pairs!	8-20 pairs (3)!	8-20 pairs!	Mostly 8-12 pairs in my specimens!
Leaflets (pinnules) very numerous (30-40 pairs or even more); linear, from under 2 lines to nearly 5 lines long, according to the variety.	30-35 pairs! Slightly distant (1), distant 1-16th inch to 1 line! Long and narrow, usually 3-4 lines (B), up to 6 lines! *Many* times longer than broad (1); cylindric-linear, blunt (1). Typically linear, approaching a mathematical line!	30-60 pairs! Closely approximated (1) (3) obtuse; 2-3 lines long (B); *several* times longer than broad (1) (3); very short linear (1); length varies; they have measurable width!	15-30 pairs! Small, narrow (B); approximately same shape and size as *mollis.*	20-40 pairs! Small, often under 2 lines (B); approximately same shape and size as *mollis!*
.....	Glands numerous along the primary rachis (B). The pinnæ are opposite, and the glands are at or close to their junction with the rachis! Usually only one gland to each pair of pair of pinnæ!	Glands numerous along the primary rachis (B). The pinnæ are opposite, and the glands are at or close to their junction with the rachis. Usually only one gland to each pair of pinnæ!	Glands few (B). Rather numerous, usually commencing half up the primary rachis, and continuing to the last pair!	Glands few; often only under the last 1 or 2 pairs of pinnæ (B). They often even require careful search to find them!

ACACIA DECURRENS (Willd).	Variety—*NORMALIS.*	Variety—*MOLLIS.*	Variety—*LEICHHARDTII.*	Variety—*PAUCIGLANDULOSA.*
Flower heads small, globular, in axillary racemes, the upper ones forming a terminal panicle.	Flower heads of medium size !	Apparently largest flower heads !	Apparently smallest flower-heads !	Flower-heads of medium size !
Flowers, 20-30 in the head, mostly 5 merous.	About 25 in each variety !	.....	.....	....
Calyx short, broadly lobed, ciliate.	As long as the petals ! Ciliate on interior of lobes !	Slightly longer than petals ! Ciliate on interior of lobes !	Less ciliate than others !	Not so deeply lobed as other var., and less broadly lobed. Ciliate on midrib.
Petals, with slightly prominent midribs.	Slightly depressed.	Ditto, F.v.M. Few *hairs* (?) near outer edge of apex.	Petals slightly ribbed, with few hairs, which spread as they near the apex !	Not ciliate. Midrib less distinct than others, if any.
Pods, usually 3-4 inches long ; about ¼ inch broad or rather more.	4 inches in average size ; the pods of the varieties hardly differ in width ! Rather narrow (1).	2-3 inches in average size ! Rather narrow (1), narrow linear (3), ripens very tardily (1).	....	Apparently same size as *normalis !* Often scabrous and sometimes even tuberculate !
More or less contracted between the seeds.	Fruit strongly compressed, much contracted between the seeds (1).	Much contracted between the seeds (1).	.....	.....
Seeds ovate (B), small as compared with those of most other arboreous acacias !	The seeds do not appear to vary with the different varieties !	.....	....	....
....	Arillar appendage pale, much shorter than the seed (1). Applies also to the other varieties !	....	....	....

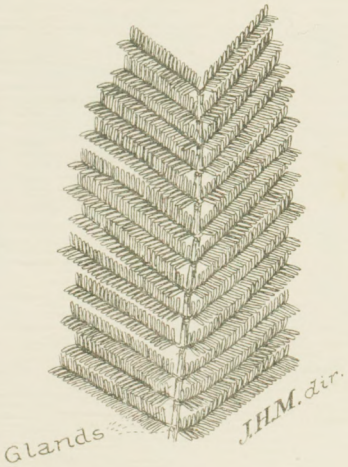


Section ✧
normalis



Section ◇
Leichhardtii

Section ◇
pauciglandulosa



Section ◇
mollis

Foliage of Varieties of Acacia decurrens

52*76_31(h)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

Read App. 2

TIME OF FLOWERING.

It has been thought that the period of flowering affords an infallible guide to the discrimination of at least two varieties, *e.g.*, *normalis*, a winter, and *mollis*, a summer flowerer. Perusal of the following table will, however, show that the time of flowering is not an absolute criterion. Knowledge of the flowering period is, however, often useful to people who have devoted particular attention to the wattles of a district. Sometimes the same tree flowers twice in a season, and the period of flowering is affected by climatic influences of a particular district and a particular season.

normalis.	Locality.	*mollis.*	Locality.	*Leichhardtii.*	Locality.	*pauciglandulosa.*	Locality.
June	Sydney.	June	Booral, near Stroud.	July.....	Queensland (2).	June	County of Gloucester, N.S.W.
July	Sydney.	July.....	Greta, Newcastle.	August ...	Mogo, Bateman's Bay, N.S.W.	July	Tewantin, Queensland.
,, ...	Campbelltown.	August ...	Port Stephens.	September	Nelligen, Bateman's Bay.	August	Port Stephens.
,, ...	Picton and Bargo.	September	Burwood, Sydney.			December.....	Stroud Road, Hunter River.
August	Sydney.	,, ...	Middle Head, Sydney.			February	Bateman's Bay.
September	Sydney.	October ..	Illawarra.				
		,, ...	Port Stephens.				
		November	Port Stephens.				
		December	Major's Creek.				
		,, ...	Sydney.				
		January ...	Major's Creek.				
		, ...	Araluen.				

Appendix III.—Tabular Statements of Wattle Bark Analyses.

(*a.*) THE MOST VALUABLE WATTLE BARKS.

(Each Table arranged in Alphabetical Order of species names).

[The reason why so many analyses have been presented, is because it is only by perusal of a series of results that the value of a particular species of bark can be properly judged. It is, for instance, of very little use to say that the percentage of tannic acid in a certain bark is from 10 to 20, without means are emp'oyed to make it perfectly clear, whether the majority of results are nearer 10 than 20].

Local Name.	Species Name.	Percentage of Tannic Acid.	Authority.*	Where Grown.
Illawarra black wattle.....	*binervata*..	30·4 28·0	....	N.S.W.
	,, ...	27·75 19 3	.....	,,
Sydney black wattle	*decurrens. var. normalis*	32·33 31 5	.....	,,
Green Wattle	,, *mollis*..	36·3 36·20	.....	,,
	,, ,,	36·25 29·0	.....	V.
	,, ,,	35 56	.....	,,
	,, ,,	35·3 34·85	.....	,,
	,, ,,	34·4 34·0	.....	,,
	,, ,,	33·25 33·5	.....	,,
	,, ,,	32 08 31·75	.....	,,
	,, ,,	31·23 30·25	.....	,,
	,, ,,	29·25	.....	,,
	,, ,,	28·52 27·5	.....	,,
	,, ,,	24·13 22·0	.....	,,
	,, ,,	15·08	Exhibition Commissioners.	Q.
	,, *Leichhardtii*	29·25 26·4	.....	N.S.W.
	,, ,,	26 0 25·75	.....	,,
	pauciglandulosa ...	31·75 27·0	.....	,,
	,, ...	22·1	.....	,,
A mountain hickory.....	*elata*	31·1 28·5	.....	,,
	,, ...	28·0 20·11	.....	,,
Mountain hickory.....	*penninervis*	34·0	.....	,,
	,, ...	32·25 32·0	.....	,,
	,, ...	29·03 25·25	.....	,,
	,, ...	18·24	.....	Q.
	,, ...	17·9	Mueller.....	V.
	,, ...	14·49	Exhibition Commissioners.	Q.
S. A. Broad-leaved wattle..	*pycnantha*	46·47 42·1	.....	S.A.
	,, ...	41 75 39·1	.....	,,
	,, ...	38 5 37·25	.....	,,
	,, ...	37·5 36·25	.....	,,
	,, ...	36·5 35·95	.....	,,
	,, ...	35·45 35·5	.....	,,
	,, ...	35·5 33 75	.....	,,
	,, ...	32·95 32 1	.....	,,
	,, ...	30·0 28·5	.....	,,
	,, ...	21·2 15·1	.....	,,
W. A. Weeping wattle.....	*saligna*	30·0	Mueller.....	W.A.
	,, ...	28·0	.....	N.S.W. (Cultivated in.)
.....	*vestita*	33·2	.....	,,

* Where no authority is stated the analysis is mine.

(*b*) WATTLE-BARKS OF SECONDARY VALUE.

Local Name.	Species Name.	Percentage of Tannic Acid.	Authority.	Where grown.
	amœna *	23·5		N.S.W.
A blue bush	*brachybotrya*	21·1, 18·0		S.A.
Black wattle	*Cunninghamii*	12·32		Q.
	,,	9·13	Exhibition Commissioners.	Q.
Silver wattle	*dealbata*	25·9, 25·5		N.S.W.
	,,	24·13, 24·0		,,
	,,	24·0, 21·22		,,
	,,	20·3, 17·1		,,
	,,	16·5		,,
A brigalow	*excelsa*	16·09	London firm.	Q.
Brigalow	*harpophylla*	11·59		,,
	implexa	14·16		,,
	,,	7·82		N.S.W.
A sally	*linifolia*	11·13		Q.
Golden wattle	*longifolia*	18·93, 15·99		N.S.W.
	,,	15·34		,,
	,,	12·67	Staiger	Q.
	,,	5·0		N.S.W.
	,, *var floribunda*	6·09, 2·54		,,
Blackwood	*melanoxylon*	11·12		,,
A black wattle	*neriifolia*	13·91	Exhibition Commissioner.	Q.
A silver wattle	*podalyriæfolia*	12·40		,,
Grey wattle	*prominens*	19·75, 18·03		N.S.W.
	,,	14·42, 11·0		,,
	pruinosa	24·25, 23·0		,,
Cooba, or native willow	*salicina*	15·1, 13·51		,,
	,,	13·21		,,

* This table refers to *barks* only, and not to size of trees. This species, for instance, is too small to be available for bark stripping, as may be seen by reference to the proper page. These small shrubs, whose bark is of good quality, may, however, eventually be used in extract-making.

(*c*) WORTHLESS * WATTLE BARKS,

Local Name.	Species Name.	Percentage of Tannic Acid.	Authority.	Where grown.
Mulga	*aneura*	4·78, 2·32		N.S.W.
Kangaroo thorn	*armata*	3·0		,,
Hickory	*aulacocarpa*	7·34		Q.
Wait a while	*colletioides*	4·4		N.S.W.
	complanata	10·28		Q.
	flavescens	10·2	Staiger	Q.
A myall or boree	*glaucescens*	8·10		N.S.W.
Curly or narrow leaved yarran	*homalophylla*	9·06		,,
	leptocarpa	10·20		Q.
Miljee	*Oswaldi*	9·72		N.S.W.
Bastard gidgee	*pendula*	3·25		,,
A yarran	,, *var glabrata*	7·15		,,
	polystachya	7·59		Q.
	pravissima	10·66		N.S.W.
Nealie or needle bush	*rigens*	6·26		,,
A thorny wattle	*sentis*	10·26, 6·32		,,
	siculiformis	7·87		,,
	stenophylla	9·49		,,
River wattle	*subporosa*	6·6	Mueller	V.
	,,	6·6		N.S.W.
Dead finish	*tetragonophylla*	5·59		,,
	verniciflua	3·16		,,

* Some of the best of these may, however, find use in extract-making in the future.

INDEX.

[10 Plates.]

Sydney: George Stephen Chapman, Acting Government Printer.—1891

DEPARTMENT OF PUBL[illegible]-TECHNICAL EDUCATION BRANCH.

SYDNEY TECHNICAL COLLEGE.

DEPARTMENT OF AGRICULTURE :—Agriculture, Botany, Woolsorting.

DEPARTMENT OF MECHANICAL ENGINEERING :—Mechanical Drawing, Machine Construction, Applied Mechanics, Patternmaking, Blacksmithing, Boilermaking, Fitting and Turning Carriage Building.

DEPARTMENT OF SANITARY ENGINEERING :—Sanitary Engineering of Building, Sanitary Plumbing (Practical and Theoretical).

DEPARTMENT OF ARCHITECTURE :—Architecture, Building Construction, Carpentry and Joinery, Bricklaying, Masonry, Stone and Marble Carving, Cabinetmaking, House Painting Plumbing (Practical), Use of the Slide Rule.

DEPARTMENT OF MANUAL TRAINING :—Manual Training.

DEPARTMENT OF ART :—Geometry, Practical Plane (Art), Solid and Descriptive (Science), Model and Object Drawing, Freehand Drawing, Perspective, Design, Modelling, Art Decoration.

DEPARTMENT OF CHEMISTRY :—Chemistry (Practical and Theoretical), Lithography.

DEPARTMENT OF COMMERCIAL ECONOMY :—Book-keeping, Caligraphy and Correspondence Shorthand, Typewriting, French, Latin, Mathematics.

DEPARTMENT OF DOMESTIC ECONOMY :—Household Management, Cookery, Scientific Dress cutting, Tailors' Cutting.

DEPARTMENT OF GEOLOGY, MINERALOGY, AND MINING :—Geology, Mineralogy, Mining

DEPARTMENT OF PHARMACY :—Materia Medica and Pharmacy, Pharmaceutical Chemistry Dispensing, Anatomy and Physiology, Practical Sick Nursing in the Home, Mechanical Dentistry.

DEPARTMENT OF PHYSICS :—Physics, Electricity, Telegraphy.

Scale of Fees (Payable to the Registrar in Advance).

	Fees: One Term.			Second and Third Terms.			Taking the Course—viz, Three Terms.		
No. of Lessons in the week	1	2	3	1	2	3	1	2	3
Seniors (per term)	8/	16/	20/	12/	24/	30/	20/	40/	50/
Juniors ,, ...	4/	8/	10/	6/	12/	15/	10/	20/	25/

The Junior scale applies to Male Students under 21 years of age and in receipt of less than 30s (thirty shillings) per week, and also to Female Students.

The Three Terms are as follows:—

9th February to 16th May; 18th May to 22nd August; 24th August to 28th November, 1891 Annual Examinations take place in December.

Branch Technical Schools or Science and Art Classes are also in operation in the following suburbs :—Ashfield, Balmain, Burwood, Glebe, Hunter's Hill, Kogarah, Marrickville, Newtown, North Sydney (late St. Leonards), Paddington, Petersham, Redfern, and in the Country Districts at Armidale, Bathurst, Bega, Broken Hill, Eskbank, Goulburn, Granville, Hamilton, Lambton, Liverpool, Maitland, Merewether, Minmi, Morpeth, Moruya, Newcastle, Orange, Parramatta, Seaham, Silverton, Singleton, Stockton, Tamworth, Tighe's Hill, Wagga Wagga, Wallsend, West Wallsend, Waratah, Wickham and Wollongong.

Classes in other subjects will be formed (if warrantable) on the application of twelve intending Students, and payment of Fees.

Any person (male or female) may join the Classes, on "*payment in advance*" of the Fees as per scale

Certificates of Efficiency will be granted at the Annual Examination in December to those who have completed courses prescribed in the Curriculum.

Students are referred to the Calendar for more detailed information.

The Classes are closed on Public Holidays.

Further information may also be obtained from the Registrar (F. T. Bartlett) of the Sydney Technical College, 48, Young-street.

TECHNOLOGICAL MUSEUM.

(*Curator—J. H. MAIDEN, F.L.S., F.C.S.*)

The Technological Museum is situated in the Outer Domain, Sydney, and contains about 30,000 specimens. The Museum is open to the public every afternoon, and also on Sundays.

Visitors, Students, and those in search of urgent special information are allowed admittance in the mornings, and the Curator will also advise probable sources of information, provided requirements cannot be satisfied at the Museum. [Local Museums have been established at Bathurst, Goulburn, Newcastle, and West Maitland.]

The New Site for the Sydney Technical College, including Technical Workshops and Technological Museum, situated in Harris-street, Ultimo (near Redfern Railway Station), has been appropriated, and a removal from the various premises at present rented is contemplated, as soon as the buildings are erected and fit for occupation.

F. BRIDGES,
Superintendent of Technical Education.

Head Office, 48, Young-street.