

DEPARTMENT OF AGRICULTURE,
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FORESTRY:

Some Practical Notes on Forestry suitable for
New South Wales.

CONIFERS.

BY

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Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

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XVII.

Conifers.

I.

I now propose to give lists of plants suitable for cultivation in New South Wales, but it is obvious that in the first place we must endeavour to obtain a settled nomenclature. In no group of plants is the nomenclature more unsettled than in the Coniferæ.

I give a list of the genera from three works:—

1. Eichler, in Engler's "Nat-Pflanzenfamilien." (1889.)
2. Engler's "Syllabus der Pflanzenfamilien." (1898.)
3. Veitch's "Manual of the Coniferæ," by Adolphus H. Kent. (1900.)

It will be observed that Veitch's Tribe Salisburineæ is partly Engler's Taxeæ of the Family Taxaceæ.

Veitch's Tribe Taxineæ is Engler's Family Taxaceæ with Salisburineæ excluded.

Eichler divides the Family Coniferæ into the two Sub-families Pinoideæ and Taxoideæ.

Engler calls Coniferæ a "Class" (abolishing the old name Natural Order for it), and divides it into two Families, Taxaceæ and Pinaceæ.

There are some minor differences of sequence in the three schemes.

I believe that, in a few years, the three classifications will fall into line.

For the purpose of the present work, I think it will be a convenience to English readers if the classification of Veitch's Manual be employed almost in its entirety. I hope that we shall have a Conifer Conference shortly to determine nomenclature as far as it is possible to attain finality in a case like this.

Eichler (*Nat. Pflanzen-Familien* ; 1889).

Family.—**CONIFERÆ.**

Sub-family I.—PINOIDEÆ.

Tribe I.—ABIETINEÆ.

Sub-tribe 1.—*Araucariinæ*

- | | |
|-------------|---------------|
| 1. Agathis. | 2. Araucaria. |
|-------------|---------------|

Sub-tribe 2.—*Abietinæ.*

- | | |
|-----------------|-----------|
| 3. Pinus. | 7. Picea. |
| 4. Cedrus. | 8. Tsuga. |
| 5. Larix. | 9. Abies. |
| 6. Pseudolarix. | |

Sub-tribe 3.—*Taxodiinæ.*

- | | |
|-------------------|--------------------|
| 10. Sciadopitys. | 14. Cryptomeria. |
| 11. Cunninghamia. | 15. Taxodium. |
| 12. Athrotaxis. | 16. Glyptostrobus. |
| 13. Sequoia. | |

Tribe II.—CUPRESSINEÆ.

Sub-tribe 1.—*Actinostrobinaæ.*

- | | |
|--------------------|--------------|
| 17. Actinostrobus. | 19. Fuzroya. |
| 18. Callitris. | |

Sub-tribe 2.—*Thujopsidinæ.*

- | | |
|-----------------|------------|
| 20. Thujopsis. | 22. Thuja. |
| 21. Libocedrus. | |

Sub-tribe 3.—*Cupressinæ.*

- | | |
|----------------|-------------------|
| 23. Cupressus. | 24. Chamæcyparis. |
|----------------|-------------------|

Sub-tribe 4.—*Juniperinæ.*

25. Juniperus.

Sub-family II.—TAXOIDEÆ.

Tribe I.—PODOCARPEÆ.

- | | |
|-------------------|-----------------|
| 26. Saxegothæa. | 28. Podocarpus. |
| 27. Microcachrys. | 29. Dacrydium. |

Tribe II.—TAXEÆ.

- | | |
|-------------------|--------------|
| 30. Phyllocladus. | 33. Torreya. |
| 31. Ginkgo. | 34. Taxus. |
| 32. Cephalotaxus. | |

Engler's *Syllabus der Pflanzenfamilien* (1898).

Class.—**CONIFERÆ.**

Family TAXACEÆ.

Tribe I.—PODOCARPEÆ.

- | | |
|------------------|---------------|
| 1. Saxegothæa. | 3. Podocarpus |
| 2. Microcachrys. | 4. Dacrydium. |

Tribe II.—TAXEÆ.

- | | |
|------------------|------------|
| 5. Phyllocladus. | 8. Torreya |
| 6. Ginkgo. | 9. Taxus. |
| 7. Cephalotaxus. | |

Family PINACEÆ.

Tribe I.—ARAUCARIEÆ.

- | | |
|-------------|---------------|
| 1. Agathis. | 2. Araucaria. |
|-------------|---------------|

Tribe II.—ABIETINEÆ.

- | | |
|-----------------|-----------------|
| 3. Larix. | 7. Picea. |
| 4. Pseudolarix. | 8. Tsuga. |
| 5. Cedrus. | 9. Pseudotsuga. |
| 6. Pinus. | 10. Abies. |

Tribe III.—TAXODIEÆ.

- | | |
|-------------------|--------------------|
| 11. Sciadopitys. | 15. Cryptomeria. |
| 12. Cunninghamia. | 16. Taxodium. |
| 13. Sequoia. | 17. Glyptostrobus. |
| 14. Arthrotaxis. | |

Tribe IV.—CUPRESSINEÆ.

Sub-tribe 1.—*Actinostrobinæ*.

- | | |
|--------------------|---------------|
| 18. Actinostrobus. | 20. Fitzroya. |
| 19. Callitris. | |

Sub-tribe 2.—*Thujopsidina*.

- | | |
|-----------------|------------|
| 21. Thujopsis. | 23. Thuja. |
| 22. Libocedrus. | |

Sub-tribe 3.—*Cupressina*.

- | | |
|----------------|--------------------|
| 24. Cupressus. | 25. Chamaecyparis. |
|----------------|--------------------|

Sub-tribe 4.—*Juniperina*.

- | | |
|---------------|--|
| 26 Juniperus. | |
|---------------|--|

We have thus two large Families, the *Taxaceæ*, with usually a fleshy fruit enclosing a single seed, and greatly resembling a drupe (the fruit of a cherry is a familiar form of drupe), and the *Conifereæ* proper, with dry, woody scales and numerous seeds which make up the fruit of this section. A Pine-cone is a typical example of the true *Conifereæ*, but the fruits of *Conifereæ* are not all cone-shaped.

The so-called berries (galbuli) of the Juniper have a superficial resemblance to the fruits of *Taxads*, but structurally they conform to the strobiles or fruits of the *Conifereæ*, the confluent scales being fleshy or succulent, instead of ligneous.

The work I have chiefly consulted in the compilation of these notes is the 2nd Edition of Veitch's "Manual of the *Conifereæ*," which Dr. Maxwell T. Masters personally and warmly recommended to me. Dr. Masters is the greatest British authority on *Conifereæ*, and one of the foremost in the world, so that his writings should also be referred to in points of doubt. A defect of the book to Australians lies in the fact that, as a very general rule, only those *Taxads* and *Conifers* are dealt with which are hardy in Great Britain and Ireland. An index list of all *Conifereæ* would be desirable.

For American *Conifers*, the work of the greatest dendrologist of that continent, Prof. C. S. Sargent, has been often quoted. The references "Sargent, t. 600" (as the case may be) refer to the beautiful illustrations in his monumental "Silva of North America."

As regards Japanese Conifers, Andrew Murray's "The Pines and Firs of Japan" (1863) will be found valuable, if only for its excellent illustrations.

The "Botanical Retrospect" given at pp. 102-105 of Veitch's Manual is valuable.

Veitch's *Manual of the Coniferæ* (1900).

TAXACEÆ.

"Trees or shrubs with homomorphic, rarely dimorphic, ramification. Leaves persistent, rarely deciduous. Staminate flowers composed of numerous stamens arranged in a globose head or cylindric spike. Ovuliferous flowers composed of few or several imbricated scales that are membranous or become fleshy, never ligneous. Ovules erect or pendulous, surrounded at the base by a fleshy, rarely desiccate arillus, which wholly or in part encloses the ripe seed; rarely exarillate. Maturation of fruit annual, rarely biennial." P. 107.

Tribe—SALISBURINEÆ.

Flowers diœcious, rarely monœcious. Stamens numerous. Ovules erect.

Branchlets dimorphic. Leaves deciduous.

Staminate flowers umbellate 1. *Ginkgo*.

Branchlets homomorphic. Leaves persistent.

Staminate flowers crowded; stamens capitate 2. *Cephalotaxus*.

Staminate flowers solitary; stamens spicate 3. *Torreya*.

Tribe—TAXINEÆ.

Flowers monœcious or diœcious. Seed enclosed in a dry testa with or without a fleshy arillus.

Sub-tribe 1.—*Taxee*.

Ovules erect or ultimately becoming so.

Ovuliferous flowers perulate.

Branchlets leaf-like, entire or lobed. Leaves on adult

plant squamiform, deciduous 4. *Phyllocladus*.

Branchlets terete. Leaves homomorphic, persistent 5. *Taxus*.

Ovuliferous flowers without perulæ.

Branchlets terete, often much subdivided. Leaves

heteromorphic 6. *Dacrydium*.

Sub-tribe 2.—*Podocarpeæ*.

Ovules inverted or ultimately becoming so.

Peduncle and bracts conrescent and fleshy. Leaves hetero-

morphic 7. *Podocarpus*.

Peduncle ligneous.

Fruits solitary or loosely spicate. Leaves linear 8. *Prumnopitys*.

Fruits aggregated.

Flowers monœcious. Leaves linear and spirally arranged 9. *Saxegothæa*.

Flowers diœcious. Leaves squamiform, four-ranked 10. *Microcachrys*.

CONIFERÆ.

"Trees or shrubs, with resinous secretions and homomorphic, rarely dimorphic, ramification. Leaves persistent, occasionally deciduous. Staminate flowers composed of numerous stamens arranged in close-set spirals around a common axis. Seminiferous flowers composed of a central axis on which the ovuliferous scales are inserted spirally or in decussate pairs, rarely in whorls of three; scales made up of two parts, the bract which is free, adnate at the base, or conrescent, and the seminiferous ligneous, rarely fleshy, lamina bearing two or more erect or pendulous ovules. Seeds 2-9, winged or without wings, and destitute of an arillus."—(Veitch's *Manual of Coniferæ*, 2nd Ed., p. 163.)

Tribe—CUPRESSINEÆ.

Flowers monœcious, rarely diœcious. Stamens in decussate pairs or in whorls of three. Scales of the mature strobiles (fruits) opposite or whorled, rarely sub-spirally arranged, consisting of two parts although apparently simple, the bract being conerescent with the scale except at the apex. Ovules erect, 1-9 in one-two series.

Sub-tribe 1.—*Juniperineæ*.

Scales of strobiles (galbuli) conerescent and becoming fleshy.

Leaves homo- or dimorphic, in whorls of three or in decussate pairs. Staminate flowers axillary or terminal

1. *Juniperus*.

Sub-tribe 2.—*Thuineæ*.

Scales of strobiles ligneous in decussate pairs. Branchlets flattened or angulate. Foliage dimorphic; primordial leaves free and spreading; adult leaves squamiform, appressed or more or less conerescent. Scales of strobiles in decussate pairs or sub-spirally arranged.

Flowers diœcious, uppermost scales only of the strobiles fertile 2. *Fitzroya*.*

Flowers monœcious, scales of strobiles thickened.

Scales of strobiles horizontal at the base, with a peltate expansion, and bearing two or more seeds 3. *Cupressus*.

Scales of strobiles ascending, oblong or broadly clavate.

Scales 8-12, more or less imbricated; seeds winged or wingless 4. *Thuia*.

Scales 4-6, valvate, the middle or largest pair only fertile; seeds with an oblique wing at the apex... .. 5. *Libocedrus*.

Tribe—TAXODINEÆ.

Flowers monœcious, on different branches. Staminate flowers solitary, spicate, paniculate or umbellate; terminal or axillary; stamens spirally crowded. Scales of strobiles spirally arranged and composed of two structures at first distinct, the ovuliferous scale and a bract-like appendage which coalesces with it and becomes obliterated in the mature ligneous, seed-bearing scale. Ovules 2-9, erect or inverted.

Leaves homo- or heteromorphic, persistent.

Staminate flowers solitary.

Anther cells, 2. Strobiles globose, with the scales ascending, subacuminate at the apex.

Seeds 3-6, pendulous 6. *Athrotaxis*.

Staminate flowers spicate.

Anther cells, 3-5. Strobiles globose, with the scales ascending, sub-peltate, and acutely lobed at the apex.

Seeds 4-5, erect 7. *Cryptomeria*.

Anther cells, 2-5. Strobiles cylindrical, with the scales horizontal and thickened into a rhomboidal apex with a transverse depression at the centre.

Seeds 5-7, pendulous 8. *Sequoia*.

Leaves homo- or dimorphic, deciduous.

Staminate flowers paniculate or solitary.

Anther cells, 4-8. Strobiles globose or obovoid, with the scales imbricated, rugose, and obscurely mucronate.

Seeds 2, erect 9. *Taxodium*.

* *Callitris* is here omitted. Referred to later in the series.

Leaves dimorphic, squamiform and cladodiform (*i.e.*, deciduous scale-like leaves and persistent leaf-like structures that perform the functions of foliation).

Staminate flowers umbellate.

Anther cells, 2. Strobiles ovoid-cylindric, the scales imbricated with a transverse ridge beyond the middle and not thickened at the apex.

Seeds 7-9, erect 10. *Sciadopitys*.

Tribe—ARAUCARINEÆ.

Flowers monœcious or diœcious. Staminate flowers umbellate or solitary, terminal or axillary. Stamens mostly pendulous and free, with 3-12 or more longitudinally dehiscent anther cells. Cones with the scales spirally arranged, in the twofold structure of which the bract greatly predominates; the ovuliferous scale confluent and reduced to an inconspicuous cellular projection. Seeds pendulous, free or concretescent with the scale.

Flowers monœcious.

Staminate flowers umbellate and terminal.

Seeds 3, pendulous and free 11. *Cunninghamia*.

Staminate flowers solitary and axillary.

Seeds solitary, free 12. *Agathis*.

Flowers diœcious, rarely monœcious.

Staminate flowers solitary or clustered.

Seeds solitary, concretescent with the scale 13. *Araucaria*.

Tribe—ABIETINEÆ.

Flowers monœcious. Staminate flowers terminal or axillary, solitary or spicate, often densely clustered, rarely umbellate. Stamens spirally crowded; anther cells, 2; dehiscence longitudinal, rarely transverse. Scales of fruit-cones spirally arranged, and consisting of two structures, the bract and seed-scale or sporophyll, the former more or less free or concretescent. Seeds 2, inverted.

Sub-tribe 1.—*Pineæ*.

Fruit-cones maturing in two, rarely in three, years. Leaves dimorphic, the primordial scattered; the secondary fascicled, persistent. 14. *Pinus*.

Sub-tribe 2.—*Laricææ*.

Branchlets dimorphic, the one elongated, with the leaves scattered and inserted on cortical outgrowths (pulvini); the other arrested or "spur-like," with the leaves fascicled.

Fruit-cones maturing in one year. Leaves deciduous.

Staminate flowers solitary, seed-scales persistent ... 15. *Larix*.

Staminate flowers umbellate, seed-scales deciduous... 16. *Laricopsis*.*

Fruit-cones maturing in two years. Leaves persistent.

Staminate flowers solitary, seed-scales persistent ... 17. *Cedrus*.

Sub-tribe 3.—*Sapineæ*.

Leaves persistent, for the most part homomorphic, and inserted on cortical outgrowths or pulvini decurrent from their base. Fruit-cones maturing in one year.

* *Pseudolarix*. Referred to later in the series.

- Leaves sessile or very shortly petiolate, angulate or flat, with 1-2 lateral resin canals. Cones often large and pendulous ; scales persistent 18. *Picea*.
- Leaves petiolate, flat, with a central resin canal. Cones small and pendulous ; scales persistent 19. *Tsuga*.
- Leaves flat, with two lateral resin canals. Staminate flowers solitary or umbellate. Cones pendulous (or erect) ; scales persistent 20. *Abietia*.*
- Leaves flat, rarely angulate, with two lateral resin canals. Cones large and erect ; scales deciduous 21. *Abies*.

Personally, I am very fond of Conifers, and it is a matter of regret to me that the Sydney climate is not suitable to many which possess aromatic foliage, whose refreshing odour appears to be best developed in cold countries. At the same time, Conifers should be grown in this State in very much greater variety than at present. *Pinus insignis* is grown by tens of thousands, and it is admittedly a useful tree, but growers should be willing to give greater variety to their plantings ; and, to meet this, our nurserymen are willing to meet a demand. It is with the twofold view of stimulating a desire for the cultivation of Conifers in New South Wales, and of presenting the modern nomenclature for an over-named family of plants, that this imperfect sketch has been prepared.

Only those Conifers likely to flourish in some part or other of New South Wales have been included. But acclimatisation work is full of surprises and I hope many surprises, as far as Conifers are concerned, are in store for us in New South Wales.

Many Conifers will be grown purely for ornamental purposes, as specimen trees. These will be given plenty of room, in order that their branches may spread out, and that each individual plant may live its life without dominance or interference by any other vegetation.

* For shelter belts the trees will be planted rather thickly. In planting for timber, the trees are planted in regular rows at a distance apart determined by the situation and the nature of the tree, in order that lateral branches, which produce the "knots" of timber, particularly objectionable in the Coniferae, which yield the timber most generally known as "Pine" of one sort or another, may be eliminated,—may atrophy during the struggle of the forest after the light.

I have had a good deal of difficulty in getting suitable photographic illustrations ; I intend to publish others as I receive them. Will correspondents help and will they send me photographs of well grown trees whether Conifers or not for succeeding chapters ?

I am desirous of keeping a record of the introduced Conifers which flourish in various parts of this State. I shall, therefore, esteem it a great favour if correspondents will favour me with twigs (bearing cones, if possible) of any Conifers in their districts, with particulars as to size of shrub or tree, and a statement as to suitability for a particular climate and soil.

* Should be *Pseudotsuga*, for reasons stated later in the series. *Keteleeria* is, in the opinion of some authorities, a distinct genus.

II.

TAXACEÆ.

Tribe—SALISBURINEÆ.

1. *Ginkgo*, L.(1.) *G. biloba*, L. (*Salisburia adiantifolia*, Sm.) The "Maiden-hair tree."

A remarkably beautiful tree for cold situations, and very easy of culture. One of the few deciduous Taxaceæ. Height, usually 20–30 feet, but may attain a much larger size. It should be in every collection. There is a good specimen in the Botanic Gardens, Sydney, which fruits abundantly every year, but it does not attain its full development there. The leaves and venation resemble those of huge maiden-hair fern leaves, except in size; the fruit, hardly so pointed as figured in Veitch, is an inch long and more, almost orange-coloured, with a "bloom," the flesh acrid or rancid smelling, while the seeds are stated to be eaten in Japan. For a note on the uses of the fruit of the *Ginkgo*, see "The Garden," 11th May, 1901, p. 341.

Those who desire to know more about this interesting tree may refer to "A Chapter in the History of the Coniferæ (*Ginkgo*)," *Nature*, xxiii, 251.

It is propagated readily from cuttings.

M 30, L 6 c, 15 b, 26* (Sydney Botanic Gardens).

2. *Cephalotaxus*, Sieb. and Zucc.

Closely allied botanically to *Ginkgo*.

"The fruits of both genera are destitute of an aril, its place being taken by the testa of the seed, which becomes succulent. The seed or nut, which is enclosed in a hard ligneous shell, is covered with a brown membrane, the lower half of which is adherent to the shell. There is also a well-marked pollen chamber in the nucellus of the seed."†—(Veitch's *Manual of Conifere*, 2nd edition, p. 111.)

The genus comes from China, Japan, and the Himalayas.

(1.) *C. Fortunei*, Hooker. See *Bot. Mag.*, t. 4499.

A shrub or small tree, with beautiful foliage, reminding most Australians of that of a Burrawang (*Macrozamia*), though the leaflets of the former are smaller. Sydney is too warm for its full development. It is the strongest growing of the genus in Sydney. It will do better in cold climates.

M 25, L 33 (Sydney Botanic Gardens).

(2.) *C. drupacea*, Sieb. and Zucc.

This is a native of Japan, and a low bush or small tree. It will succeed in many parts of New South Wales.

L 34 d, M 25 (Sydney Botanic Gardens).

* These numbers refer to the "Guide (with plan) to the Sydney Botanic Gardens," Svo., pp. 108; price 6d., postage 2d. extra.

† Masters in *Journ. Linn. Soc.*, xxx, 4 (1893).

3. *Torreya*, Arnott (Tumion, Rafinesque, of some American authors).

The bruised foliage of *Torreyas* emits a foetid odour, which has led to their being called "Stinking Yew."

A very handsome genus, of coarse foliage, reminding one of the true Yew.

(1.) *T. californica*, Torrey. "The Californian Nutmeg."

See Sargent, t. 513. Also *Gardener's Chronicle*, 22nd June, 1889.

Leaves nearly flat, green below, elongated. Fruit green, slightly tinged with purple. (Sargent.)

A large tree, which does best in moderately cool, well-watered localities. It does fairly well in the Sydney district.

It is a native of Californian mountain districts at a moderate elevation.

(2.) *T. nucifera*, Sieb. and Zucc. The "Japanese Nut Tree."

The kernels of the seeds yield oil, which is used for culinary purposes in Japan, but the kernel is too astringent to be eaten.

A handsome, dense-foliaged, small tree.

It is a native of southern Japan.

It does very well in the Sydney district, and, bearing in mind its native home, it will probably flourish in colder places.

U 6 (Sydney Botanic Gardens).

(3.) *T. grandis*, Fortune. The "Kaya" of China.

A strong-growing, tall bushy shrub of 15 feet in Sydney; if trimmed to a single stem, and in good soil, it would doubtless form a fair-sized tree.

M 21 (Sydney Botanic Gardens).

(4.) *T. taxifolia*, Arn. "Stinking Cedar." Sargent, t. 512. Florida, United States.

A medium-sized tree. Leaves slightly rounded on the back, pale on the lower surface. Purple fruit. (Sargent.)

It does only moderately well in the Sydney Botanic Gardens. It is, however, not in good soil. Taxaceæ are very responsive to good treatment as regards depth of good soil and moisture. In the Sydney Botanic Gardens the soil is often very light, and sometimes the dry summers are trying.

M 25 (Sydney Botanic Gardens).

Tribe—TAXINEÆ.

Sub-tribe 1.—*Taxacæ*.

4. *Phyllocladus*, L. C. Richard.

A genus in which the "leaves" are not true leaves, but metamorphosed branchlets, termed phylloclades or cladodes. These phylloclades vary a good deal in shape even in the same tree.

Six species are known, three from New Zealand, one from Tasmania, one from Borneo (*hypophylla*, Hook f.), and one (*protractus*, (Warb.) (Pilger)



Ginkgo biloba.
Botanic Gardens, Sydney.



Torreya nucifera.
Botanic Gardens, Sydney.

from New Guinea and the Philippines. The two last need not be further considered at this place.

The Sydney district is unsuited to the proper development of these beautiful trees, which should be grown by every admirer of fine trees in New England, the Blue Mountains, the Southern Tableland, &c. But a fair depth of soil is indispensable.

(1.) *P. rhomboidalis*, Hook. f.

In Tasmania it is universally known as "Celery Top," or "Celery Top Pine."

This tree, which attains a size of 50 or 60 feet in Tasmania, is common on mountains, particularly in the south and west.

It will not flourish in the Sydney districts, but should be tried in colder New South Wales.

Cheeseman (*Manual of the New Zealand Flora*, p. 658) gives the following key to the New Zealand species:—

- * Cladodes pinnately arranged.
 Tree, 50-70 ft. Cladodes, $\frac{1}{2}$ -1 in. Female flowers on the margins of the cladodes 1. *P. trichomanoides*.
 Tree, 25-40 ft. Cladodes, 1-2 $\frac{1}{2}$ in. Female flowers peduncled on the rachis below the cladodes 2. *P. glaucus*.

** Cladodes simple.

- Shrub or tree, 5-25 ft. Cladodes, $\frac{1}{2}$ -1 in. Female flowers on the margins of the cladodes near the base 3. *P. alpinus*.

They are all well figured in Kirk's "Forest Flora of New Zealand."

(2.) *P. trichomanoides*, Don.

The Maori names are "Tanekaha" and "Toatoa," and the New Zealand name "Celery-leaved Pine."

Found in both the North and South Islands, and in the latter from the sea-level to 2,500 feet. Yields a valuable timber, and the bark is often used for tanning.

M 19, L 9 (Sydney Botanic Gardens).

(3.) *P. glaucus*, Carrière.

"Toatoa."

"A very distinct species, quite the most handsome of the New Zealand Taxads, and easily recognised by the robust branches, very large cladodes, and large female flowers." (Cheeseman.)

Confined to the North Island, sea-level to 2,000 feet.

5. Taxus, L. The "Yew."

The ancient dark-leaved species cultivated in Europe from time immemorial; often seen in churchyards, and often trimmed to shape in gardens.

(1.) *T. baccata*, L. "The common Yew."

All the forms of *Taxus* are closely allied.

The foliage is poisonous to cattle. The wood was commonly used for bows in the olden times.

The Yew will not flourish in Sydney; it does well in the cooler, well-watered parts of the State.

There is a so-called variety, *argentea*, the *T. elegantissima* of nurserymen, at M 25 (Sydney Botanic Gardens); this form does fairly well in Sydney.

(2.) *T. brevifolia*, Nuttall. "Californian Yew."

Sargent, t. 514.

Leaves short, yellowish-green.

A tree of considerable size in its native country (North-western America—British Columbia to southern California).

It does not appear to be in New South Wales, though seeds from southern Californian localities should do well.

(3.) *T. cuspidata*, Sieb. and Zucc. "Japanese Yew."

A small tree, native of Japan, where it has been cultivated from time immemorial. It does only fairly in Sydney.

M 25 (Sydney Botanic Gardens).

(4.) *T. floridana*, Chapm. "Florida Yew."

Sargent, t. 515.

It is a short, bushy tree. Leaves elongated, usually falcate, dark green. It is confined to a small area in Florida, U.S.A. It would probably succeed in eastern New South Wales.

6. *Dacrydium*, Solander.

A genus of trees and shrubs, with heteromorphic foliage.

There are twelve species, of which seven belong to New Zealand and one to Tasmania. Only two are of special importance.

(1.) *D. cupressinum*, Soland. The "Rimu" or "Red Pine."

A large tree; abundant in forests throughout New Zealand, extending from the sea-level to 2,500 feet.

Cheeseman (Manual, p. 654) says of it:—"A well known tree, the young state of which, with its graceful shape and pale-green pendent branches, is, perhaps, as beautiful and attractive as any tree in New Zealand. The wood is deep red, strong, hard, and heavy, but often twisted in the grain. It is largely used for building purposes of all kinds, and for the manufacture of furniture, but is not nearly as durable as either Kauri or Totara."

This tree always suffers during dry weather in Sydney, a remark which is true of many introduced Conifers.

M 17, 19 (Sydney Botanic Gardens).

(2.) *D. Franklinii*, Hook. f.

The well known Huon Pine of Tasmania. A large tree, common in swampy localities in the south and west from the Upper Huon River to Port Davey and Macquarie Harbour.

It is so appreciated in Tasmania for its very valuable timber that it is now getting scarce.

Experiments with this tree in Sydney have so far been a failure, but it should certainly be tried elsewhere.

Sub-tribe 2.—*Podocarpaceæ*.**7. Podocarpus, L'Hérit.**

So named because of its fleshy fruit-stalk.

(1.) *P. elata*, R.Br. "She or Brown Pine."

A handsome tree, yielding durable timber, and native of the eastern part of the State. It flourishes in the Sydney district, and is well worthy of experimental cultivation.

For a figure and a full account of it, see my "Forest Flora of New South Wales," part 4.*

M 11, 24, and other places (Sydney Botanic Gardens).

(2.) *P. spinulosa*, R.Br.

A dwarf, rather spreading shrub, with somewhat prickly foliage, found in moist localities in the eastern parts of the State. It is well worthy of a place in the garden, because of its dense, neat foliage.

M 22 (Sydney Botanic Gardens).

(3.) *P. pectinata*, Planch (*Dacrydium Pancheri*, Brongn. and Gris.). New Caledonia.

We had a specimen of this in the Sydney Botanic Gardens for a number of years, but it did not flourish, and finally died. It was a small tree, and should be further experimented upon in good soil and in a sheltered situation.

(4.) *P. Totara*, D. Don.

The "Totara" of New Zealand. Common in forests from the North Cape to the south-east of Otago, from the sea-level to 2,000 feet.

A large tree, wood red, very durable, resists Teredo, and hence is esteemed for piles for wharfs. The Maoris used it for their war canoes and also for their carved houses. It will succeed in many parts of coastal New South Wales and on mountain ranges.

M 16, L 8 (Sydney Botanic Gardens), where it does very well. It does not like exposed places.

(5.) *P. dacrydioides*, A. Rich. "White Pine," "Kakikatea" or "Kahika."

This is common in the North and South Islands of New Zealand, and it extends from the sea-level to 2,000 feet. It is a tall tree, and in damp localities often grows gregariously, forming dense forests. It is a handsome species with small leaves, and the Sydney district is a little too warm for it. It is well known for its timber, "White Pine," which produces the wood most in demand for butter boxes.

M 17 (Sydney Botanic Gardens), where it does fairly well.

(6.) *P. ferruginea*, D. Don. "Black Pine," "Miro" or "Toromiro."

This also is a New Zealand species. "A tall forest-tree 50-80 feet high with a rather narrow round-topped head." (Cheeseman.)

* Government Printer, Sydney. 1s. per Part. A quarto work, each Part of which contains 4 plates, and usually photographic illustrations in addition.

It is a handsome species, and occurs in forests in the North and South Islands, from the sea-level to 3,000 feet, thus being rather more hardy than the preceding species. It yields a valuable timber.

Not in the Sydney Botanic Gardens.

(7.) *P. latifolia*, Wall. Is an Indian species with handsome broad leaves (say over an inch broad and 4 inches long), reminding one very much of an *Agathis*. It should do in the warmer parts of coastal New South Wales.

(8.) *P. Blumei*, Endl.

From the Philippines has even larger leaves. Perhaps it could succeed here also.

(9.) *P. nervifolia*, Don. (Syn. *P. macrophyllus*, Wall non Don). The "Oleander-leaved Podocarpus."

See *Bot. Mag.* t. 4655.

A much branched shrub or small tree from the temperate Himalayas, also Burma, Malaysia, &c. It should do in the Sydney district.

(10.) *P. bracteata*, Blume.

Native of Java and South Sea Islands. Seemann gives the Fijian vernacular as "Gagali."

With handsome foliage and a fair-sized tree.

M 17 (Sydney Botanic Gardens). It is in too crowded a locality to do justice to it.

(11.) *P. cupressina*, R.Br.

Burma and Malaysia.

A tree of medium size in Sydney; would be larger if it had better soil and more room. It evidently is of some promise for eastern New South Wales.

M 17 (Sydney Botanic Gardens).

(12.) *P. vitiensis*, Seemann. "Kau solo" of Fiji.

Figured and described in the *Flora Vitiensis*. Seemann describes it as one of the finest Coniferæ he has ever seen. It is a tall tree in its native islands, with specially handsome foliage. In the Sydney Botanic Gardens it is a beautiful, medium-sized tree. It would be a great acquisition to the warmer coast districts.

L 20 d (Sydney Botanic Gardens).

(13.) *P. Nageia*, R.Br. "Nagi" of the Japanese.

A medium sized tree, which has been cultivated in Japan from time immemorial.

"With the Japanese it is a great favourite, especially a variety in which the leaves are marked with broad white stripes, and this they use for dwarfing and pot culture." (Veitch.)

Not in the Sydney Botanic Gardens.



Podocarpus elata.
Botanic Gardens, Sydney.



Prumnopitys elegans.
Botanic Gardens, Sydney.

(14.) *P. macrophylla*, Don. “Maki” of the Japanese.

A low or medium sized tree of 25–40 feet in height, not broad-leaved as its name would denote, but rather narrow and erect. It is a common Japanese tree, although not known to be endemic, and is largely cultivated by Japanese horticulturists. “Around Tokio the common form is much used as a hedge plant and is often cut into fantastic shapes, whilst the variegated forms are preferred for pot culture and dwarfing.” Two of the best known varieties bear the names *argenteo-variegatus* and *aureo-variegatus*.

A variegated specimen is in the bed of variegated plants, L 35 b (Sydney Botanic Gardens).

(15.) *P. japonica*, Siebold.

Japan.

In Sydney this is a bushy shrub about 6 feet high, reminding one of a small *Taxus*.

M 17, L 9 (Sydney Botanic Gardens).

(16.) *P. elongata*, L'Hérit. (*P. pruinosa*, Zeyh.) South Africa.

This species grew in the Sydney Botanic Gardens for many years, but was a stunted plant of, say, 3 feet. It might be tried again.

(17.) *P. nubigena*, Lindl.

“A tree of Yew-like aspect, of variable dimensions according to the situation in which it is growing” (Veitch). Leaves, say, 1½ inch long.

It is a native of southern Chili, and is associated with and growing under the same conditions as *Saxegothea conspicua*. It should flourish in the bleakest mountain localities of southern Monaro.

(18.) *P. chilina*, L. C. Rich., is a much branched tree of 40–50 feet from the sub alpine Andean region of Chili. It is hardy in the south of England and Ireland, and as it is a beautiful species, it would be desirable to introduce it into the cooler regions of New South Wales.

It has leaves several inches long, much longer, indeed, than *P. nubigena*.

8. Prumnopitys.

This genus is closely allied to *Podocarpus*, and differs from it in the absence of the fleshy fruit-stalk or “receptaculum.”

(1.) *P. elegans*, Philippi.

A medium sized tree of the Andes of southern Chili, where it has a vertical range of 4,500 to 6,000 feet.

It is a bushy, handsome tree, with damson-like fruit. It flourishes well in the Sydney district, and is also hardy in the south-western counties of England and Ireland, so that it should be hardy over extensive areas in the eastern half of this State.

L 35 b (Sydney Botanic Gardens).

(2.) *P. Thunbergii*, Hook. in *Lond. Journ. Bot.*, i, 657 (1842), with figure (t. 22).

South Africa.

A fairly fast-growing, ornamental tree, with comparatively small leaves. Hardy in the eastern half of the State, and worthy of more extensive introduction.

L 1, 31 b, 6 (Sydney Botanic Gardens), where it flourishes in dry situations.

(3.) *P. spicata*, Masters. (*Podocarpus spicata*, R.Br.)

The "Matai," "Mai," or "Black Pine" of New Zealand.

Found in the North and South Islands and Stewart Island, and extending from the sea-level to 2,000 feet.

The fruit is globose, black or nearly so, and $\frac{1}{4}$ to $\frac{1}{3}$ inch in diameter. Its timber is brownish, hard, and of great strength and durability.

Not in the Sydney Botanic Gardens.

9. *Saxegothea*, Lindl.

The fruit is a fleshy globose body, less than an inch in diameter, formed by the coalescence of the fertilised scales, the individuality of which is indicated by the projecting apex.

(1.) *S. conspicua*, Lindl. "Prince Consort's Yew."

A remarkable small tree, with Yew-like aspect.

Grows (with *Podocarpus nubigena*) near the snow-line in southern Chili. We can only hope to grow this small tree in the highest southern mountain ranges, but it is of such high botanical interest that it is to be hoped that connoisseurs of trees in the Monaro will endeavour to obtain it.

A small shrub formerly in the Sydney Botanic Gardens, reminding one of *Taxus*. It grew very slowly and finally died.

10. *Microcachrys*, Hook. f.

The scales of the young cones assume a pulpy texture and bright (crimson) colour, "a character probably unique in the Order" (Veitch's Manual). Like *Saxegothea*, it forms a direct transition from the Taxads to the Coniferæ with imbricated leaves.

(1.) *M. tetragona*, Hook. f.

Figured in *Fl. Tas.*; also *Bot. Mag.* t. 5576.

A creeping, spreading shrub common on many mountain tops in Tasmania.

It can only be expected to grow in the coldest districts of New South Wales, where there is plenty of water. "Its only value (in England) as a garden plant is for conservatory decoration, for which the elegant habit it can be made to assume under pot culture, its neat foliage and bright red fruits, render it highly suitable."—(Veitch's Manual.)

III.

CONIFERÆ.

Tribe—CUPRESSINÆ.

Sub-tribe 1.—*Juniperineæ*.1. *Juniperus*.

“The Junipers are evergreen, medium-sized, or low trees of pyramidal or fastigate habit, but in old age often with rounded or flattened tops and irregular in outline; or bushy shrubs of spreading habit, occasionally quite prostrate. Their habit is greatly modified by climate and locality, and in mountainous regions by altitude and aspect, so that the same species which are arborescent in the warmer and more favoured districts are reduced to prostrate shrubs at their northern limit or highest vertical range. Instances of these extreme forms in habit occur in *Juniperus communis*, *J. excelsa*, *J. recurva*, *J. virginiana*, and others. The foliage is dimorphic, consisting either of pungent acicular or awl-shaped leaves in whorls of three, or of small scale-like leaves, closely imbricated or concretescent in decussate pairs. In some species, as *J. communis*, the acicular foliage is constant; in others, as *J. excelsa*, *J. virginiana*, it prevails up to ten, twelve, or more years, when it gradually gives place to the smaller scale-like leaves; in others again, as *J. chinensis*, both forms of leaves are present from a very early age; in the typical *J. Sabina*, at least in Great Britain, and in a few other species, the scale-like leaves only are present.”—(Veitch’s Manual.)

The genus may be divided into two well-marked sections—

a. *Oxycedri*. Leaves homomorphic, acicular or awl-shaped.

b. *Sabineæ*. Leaves dimorphic, acicular or scale-like.

(1.) *J. bermudiana*, L. “Bermuda Juniper”; “Pencil Cedar.”

A monœcious tree, attaining a large size. A handsome species, doing well in our warmer coast districts.

For figures, see Hooker in *Lond. Journ. Bot.*, ii, 141, t. 1, and Hemsley in *Gard. Chron.*, xix, p. 656 (1883).

Native of the Bermudas. Formerly much in demand for lead pencils, but now superseded by the more abundant *J. virginiana*. Apart from its beauty, it is most valuable, and its cultivation in New South Wales should be encouraged.

U 2 k, 3, L 7, 22, 30 d (Sydney Botanic Gardens).

(2.) *J. californica*, Carrière. “Californian Juniper.” Sargent, t. 517.

A tree attaining 40 feet in height. Inhabits dry mountain slopes and plains in southern California (Sargent). Surely it will, therefore, flourish in many parts of New South Wales.



Juniperus bermudiana, L.
Botanic Gardens, Sydney.

(3.) *J. chinensis*, L. "Chinese Juniper."

A dioecious tree, attaining a height of 60–70 feet in China and Japan where it is native. It also grows in the Himalayas.

It is a well known and beautiful species, which does well in many parts of this State, and very readily forms colour variations. For instance, we have the following in the Sydney Botanic Gardens :—

Variety *argentea*, L 15 ; variety *japonica-argentea*, L 11 a ; variety *aurea*, L 20 d ; variety *aureo-variegata*, L 23 a.

(4) *J. communis*, L. "The Juniper."

Usually a shrub, but some forms attain tree size.

Var. *cracovica*. "An arborescent form, with spreading branches, and long, slender, somewhat distant, subpendulous branchlets, which are at first yellowish, and furnished with longer leaves than in the common Juniper." (Veitch's Manual.)

L 7 (Sydney Botanic Gardens).

Var. *fastigiata* (*J. hibernica*). "Swedish Juniper."

An erect low tree, 12–15 or more feet high, of slender columnar habit ; the branches and their ramifications erect, rigid, and closely appressed to the principal stems and to each other ; the youngest branchlets short, and furnished with close-set leaves that are smaller and usually more brightly-coloured than in the common form. The variety cultivated in gardens under the name of *compressa* is a diminutive form of *fastigiata*.

(5.) *J. drupacea*, Labill. "Syrian Juniper."

A dioecious tree 25–30 feet high, trees of the two sexes differing somewhat in habit.

Veitch says that it has secured a place in many British gardens on account of its hardiness, the unique shade of green of its foliage, and the small space it requires. It appears to be a fact that all the trees in Britain are males.

Yields a pleasant edible fruit. See *Gard. Chron.*, 1854, 455 f.

L 11 a (Sydney Botanic Gardens).

(6.) *J. excelsa*, Bieberstein. The "Greek or Tall Juniper."

A (usually) monœcious tree of variable dimensions. It has a very extensive geographical range, from the Greek Archipelago through Asia Minor, &c., to the Himalayas. Its vertical range is also very considerable, so that one form or other of it will flourish in many parts of New South Wales.

L 6, 23 b, 35 c (Sydney Botanic Gardens).

(7.) *J. flaccida*, Schlecht.

Figured by Sargent, t. 519.

A tree of 20–30 feet. "One of the most beautiful of Junipers."



Juniperus chinensis, L. (*alba variegata.*)
State Nursery, Campbelltown.

Native of Mexico and south-west Texas at an elevation of 5,000–8,000 feet, yet, strange to say, it is tender in Great Britain, “thriving in the open air only in places where the temperature in the winter season does not fall below the freezing point, as in the south of France.”—(Veitch’s Manual.)

Not in the Sydney Botanic Gardens.

(8.) *J. occidentalis*, Hook.

Sargent, x, t. 521.

“A tree with a straight trunk, 15–25 ft. in height and 2–3 ft. in diameter, with long, stout, spreading branches.” (Sargent.)

It grows in Alpine situations, chiefly in the Rocky Mountains, U.S.A., rarely descending below 6,000 feet.

Not in Sydney Botanic Gardens.

(9.) *J. oxycedrus*, L. (Syn. *J. rufescens*, Link). “*Oxycedrus*” or “Prickly Cedar.”

A dioecious spreading shrub, and occasionally a low tree of 9–12 feet.

It is common in the Mediterranean region, ascending to 5,000 feet, but most abundant on arid rocks near the shore.

It is an untidy shrub in the Sydney Botanic Gardens; in other parts of the State it may be a better-shaped plant.

L 6, 7, 14, 15 b (Sydney Botanic Gardens).

Closely allied to *J. Oxycedrus* are the following three species:—

1. *J. brevifolia*, Parl. From the Azores.

2. *J. cedrus*, Webb. From the Canary Islands. These two forms are not in the Sydney Botanic Gardens, and should succeed with us.

3. *J. macrocarpa*, Sibth.

From localities similar to those of *J. Oxycedrus*. They grow lop-sided with us unless in sheltered situations.

L 17, 31 a, 31 b (Sydney Botanic Gardens).

(10.) *J. pachyphloea*, Torrey. The “Thick-barked Juniper.”

A tall tree of 50–60 feet in height.

A dry country species, inhabiting dry mountain slopes in Mexico and Texas, U.S.A., which might be tried in some of our dry country.

(11.) *J. phoenicea*, L. “Phoenicean Juniper.”

A monoecious, sometimes dioecious, shrub or small tree, native of the Mediterranean region from Portugal to Palestine, and growing on sterile rocky hills near the coast, as well as at higher elevations.

Var. *turbinata* has ovoid or somewhat top-shaped fruits, not spherical as in the common form.

L 16 a. (Sydney Botanic Gardens).



Juniperus sphaerica, Lindl.

Botanic Gardens, Sydney.

(12.) *J. prostrata*, Pers.

A prostrate shrub with elongated branches lying flat on the ground and much ramified.

"It is the American representative of the Savin of Europe. It inhabits cold localities in the northern United States and Canada. It is recommended as a useful plant for the rock garden and for covering exposed banks, forming dense masses of foliage which cover a considerable area when the plants are allowed to grow unchecked." (Veitch's Manual.)

It might be tried in the colder parts of this State.

(13.) *J. rigida*, Sieb. and Zucc.

Figured in *Flora Japonica* ii, 109, t, 125.

A small tree of 20-25 feet high. A species looked upon as the Japanese representative of the common Juniper. In Sydney it is quite a slow grower.

L 1, 11 a (Sydney Botanic Gardens).

(14.) *J. sabina*, L. "Common Savin or Savin Juniper."

For a figure and full account of this plant, see Bentley and Trimen's *Medicinal Plants*.

A shrub, sometimes arborescent, and often procumbent or prostrate.

It is common on the mountains of Central Europe, often ascending to a considerable elevation. It does fairly well in the Sydney district.

The leaves are used in medicine.

M 12, M 14, L 13, L 35 a (Sydney Botanic Gardens).

(15.) *J. sphaerica*, Lindl. "Globe-fruited Juniper." See Paxton's *Flower Garden*, 1850, 58, f. 35.

A tree of the habit and aspect of *J. chinensis*, attaining a height of 30-40 feet. It is a native of China.

One of the best of the Junipers for the Sydney district.

L 6, 11, 34 a, 35 c, 30 b, 31 b (Sydney Botanic Gardens).

(16.) *J. thurifera*, L. "Spanish or Incense Juniper." Figured in "Veitch's Manual."

A low or medium-sized tree of columnar or sub pyramidal outline, in places attaining a height of 35-40 feet. Fruits small, globose-ovoid, dark, brownish, violet, with a glaucous bloom.

It has a limited geographical range in the western Mediterranean region, from Cape St. Vincent, Portugal, eastward to Sierra Nevada in Spain (ascending to 3,500 feet), and extending also to the coast range of Morocco and Algiers

It is not in the Sydney Botanic Gardens at the present time.

(17.) *J. virginiana*, L. "Red Cedar" of America and England.

A tree of variable size and habit ; at its greatest development 100 feet high, with a straight trunk of 3-4 feet in diameter.

It is extensively diffused in North America, extending over a wide range with great variation of temperature.

Its timber is very valuable, and is extensively used in the manufacture of lead pencils ; the chips are used in the manufacture of Cedar-leaf oil.



Juniperus virginiana, L.
State Nursery, Campbelltown.

It does fairly well in Sydney.

L 7 (Sydney Botanic Gardens).

There is a var. *argentea* at L 15 a (Sydney Botanic Gardens).

IV.

CONIFERÆ.

Tribe—CUPRESSINEÆ.

Sub-tribe 2.—*Thuinæ*.**2. Fitzroya.**

Female amenta of 2 pairs of opposite scales, with two erect ovules at the base of each of the inner ones, not materially altering in the fruiting condition. Seeds, 3-winged.

(1.) *F. Archeri*, Benth. and Hook. f.

An erect branched shrub of 4–5 feet on mountain tops in Tasmania, *e.g.*, Mount Pelion, Adamson Peak, Mount La Perouse, Mount Dundas, &c. (Rodway).

In Veitch's Manual it is spoken of as "a low tree with a trunk sometimes 15–18 inches in diameter, more frequently a much-branched erect shrub 5–12 feet high." So that it appears to grow much taller in England than in its native habitat. It can only be expected to succeed in the coldest parts of New South Wales.

(2.) *F. patagonica*, Hook. f.

See *Bot. Mag.* t. 4616.

Native of the western slopes of the southern Andes. It attains its greatest development in southern Chili, where it is a tree of 100 feet and more.

It is not a satisfactory subject for British gardens, and will be difficult to manage here, but in view of its great botanical interest (allied as it is to a Tasmanian species) it is well worthy of trial on the southern Monaro.

Callitris.

For some reason which is not clear to me, the genus *Callitris* (*Frenela*) is omitted from Veitch's Manual.* It is the genus which consists of our Cypress Pines, so enormously developed in Australia. The closely allied and less important genus *Actinostrobus* is also omitted.

The position of both genera is next to *Fitzroya*, where I have inserted them.

I have figured the Cypress Pines in Part 12 of my "Forest Flora of New South Wales,"† and have dealt with them so fully that I do not intend to repeat myself here. The following Cypress Pines may be enumerated, and they are so beautiful and so obviously suited to various Australian soils and climates that they should be extensively planted both for ornamental and economic purposes. The timber is usually highly figured and full of resinous matter. It is especially resistant to white ants. It is short in the grain, and is deliciously aromatic.

Its resin, "Australian Sandarac," is in no way different from the Sandarac of North Africa, a valuable product.

* Sub-tropical and even tropical species of *Araucaria* are dealt with in that work.

† Government Printer, Sydney; price, 1s. per Part.

(1.) *C. Macleayana*, F.v.M., is the "Port Macquarie" or "Stringybark Pine."

It is a tall, handsome tree, and grows in coastal New South Wales (from Stroud northwards) to northern Queensland.



Callitris robusta, R.Br.
Near Wagga Wagga, N.S.W.

It is remarkable for its fibrous (stringy) bark, and for the comparative absence of figure, a rare occurrence in the genus.

(2.) *C. verrucosa*, R.Br. "Mallee Pine" or "Warty-fruited Pine."

This is a small species found in the interior of Australia. It is therefore suited to arid country. Its large warty fruits are quite handsome.

(3.) *C. robusta*, R.Br. The "White or Murray Pine."

It bears other local names, given because of its varied localities.

It is a dry country species, extending, however, a considerable distance east.

It is a beautiful tree, shapely, and its glaucous foliage contrasts well with that of other trees. It is the principal constituent of the Pine scrub of the West.



Callitris cupressiformis, Vent.
Port Jackson.

It will succeed nearly all over the State, and those in search of a beautiful Australian species for their garden are recommended to try it.

(4.) *C. columellaris*, F.v.M.

A picturesque species growing on the Northern Rivers and in coastal Queensland. It attains a large size, and its habitat indicates it as suitable for coastal planting in New South Wales. When growing in maritime situations the lateral branches are often as large as those of the main stem.

(5.) *C. Muelleri*, Benth. and Hook. f. "Blue Mountain Pine."

So called because it is found on the Blue Mountains; it occurs in other mountainous country in New South Wales.

It is a beautiful species, of medium size, sturdy, with bright green foliage, and will stand a considerable amount of cold.

(6.) *C. propinqua*, R.Br.

This is a species allied to *C. Muelleri*, but with very large cones more or less warty. Its range is extensive; it attains a fair size, and is well worthy of a place in a large garden. Found in New South Wales, Victoria, and South Australia.

(7.) *C. calcarata*, R.Br. "Red or Black Pine."

It has a good deal in common with *C. Muelleri*, and, indeed, the latter may be a form of it. It obtains its name because of its dark colour in comparison with the white (glaucous) appearance of *C. robusta*; the colour of the timber of *C. calcarata* is also usually much darker than that of *C. robusta*.

C. calcarata extends over an enormous area in New South Wales, frequenting rocky country often in the driest country, and ascending into New England and other places where the winter cold is very severe.

(8.) *C. cupressiformis*, Vent. "Port Jackson Pine."

A graceful species common in Middle Harbour, Port Jackson, and now rare in parts of Port Jackson where it was formerly common. It extends to most of the other States, but chiefly near the coast; in Victoria it is an inland species, and in New South Wales it occurs near the summit of the Blue Mountains. It is found also on Kangaroo Island, South Australia.

3. *Cupressus*. "Cypress."

"The genus *Cupressus* includes some of the most beautiful and interesting trees in Nature, and as the majority of the species are more or less hardy in Great Britain, their value as subjects for garden decoration is very great, a value greatly enhanced by the numerous abnormalities into which many of them have diverged under cultivation, and which has resulted in the 'fixing' of forms of very distinct habit and aspect originating from the same species. The most remarkable instances of polymorphism occur in *Cupressus Lawsoniana*, *C. obtusa*, and *C. pisifera*, of which it may be remarked that the abnormalities of the one for the most part simulate those of the others, thus affording evidence of order and method in the production of an apparently inexplicable diversity of forms." *—(Veitch's Manual.)

* It should, however, be noted that whilst many of these abnormalities may become "fixed" by propagation from cuttings and by grafting, many others lose their peculiar form and colour as they increase in age, the reversion to a normal type taking place more rapidly in some varieties than in others.

See also "A general view of the genus *Cupressus*" (Masters), *Journ. Linn. Soc.*, xxxi, which includes a useful list of synonyms. Masters divides the genus into two sections, viz. :—

(a) "*Eucupressus*.—Strobiles large, attaining maturity in the second year; scales ligneous, each bearing numerous seeds in one–two series. Herbaceous branch systems tetrastichous (four-ranked) but often obscured from external causes, sometimes distichous (two-ranked). Leaves mostly homomorphic :

"*Arizonica*, *Benthamii*, *funebri*, *Goveniana*, *lusitanica*, *Macnabiana*, *macrocarpa*, *sempervirens*, *thurifera*, *torulosa*.

(b) "*Chamaecyparis*.—Strobiles small, attaining maturity the first year; scales coriaceous, bearing two, rarely three–five seeds in one series. Herbaceous branch systems distichous, tetrastichous in some of the abnormal forms only. Leaves dimorphic, the lateral pairs more or less conduplicate, the dorsiventral pairs flat :

"*Lawsoniana*, *nootkatensis*, *obtus*, *pisifera*, *thyoides*."—(Veitch's Manual.)

(1.) *C. arizonica*, Greene.

A tree usually 30–40 feet in height, but occasionally much larger.

Common in Arizona, U.S.A., at an elevation of 5,000–8,000 feet. Introduced into British gardens in 1882 from the Arnold Arboretum. Speaking of Britain, Veitch's Manual says :—

"The young trees growing in this country are of fastigiate or columnar habit, with a lightish green foliage; (Thornber speaks of its "characteristic bluish-green foliage and pleasant aroma."—J.H.M.) They have up to the present time proved quite hardy, and are among the best of decorative Conifers for the lawn and small gardens." It is adapted for arid and exposed situations.—(Thornber).

It seems worthy of introduction into New South Wales, and I am trying it.

(2.) *C. Benthamii*, Endl. "Bentham's Cypress."

A tree of variable habit and dimensions according to situation and environment.

It is a native of the *tierra fria* or alpine region of Mexico, at 6,000 feet elevation and upwards. It does very well in eastern New South Wales.

L 6, 33 c (Sydney Botanic Gardens).

"Var. *Knightsiana* differs from the typical *C. Benthamii* in its more symmetrical habit, especially in the regularity of its branching, in its glaucescent foliage, and also in the more prominent umbo of the cone scales."—(Veitch's Manual.)

L 1 (Sydney Botanic Gardens).

(3.) *C. funebris*, Endl. "Funeral Cypress."

See Masters in *Journ. Linn. Soc.*, xxxi, 337, with figures.

A tree of singular aspect, with a broadly pyramidal crown, wide spreading branches and pendulous branchlets, attaining a height of 50-60 feet. It is planted in the vicinity of tombs in China, of which country, as well as the Himalayas, it is a native.



Cupressus funebris, Endl.
State Nursery, Campbelltown.

It does well in the Sydney district.

M 19, L 7, 8, 15 a, 17 e, 30 (Sydney Botanic Gardens).

(4.) *C. Goveniana*, Gordon.

Figured by Masters, *Journ. Linn. Soc.*, xxxi, 346; also by Sargent, t. 527.
A Californian species, ascending from the coast to an elevation of 3,000 feet.



Cupressus Goveniana (young plant).
State Nursery, Campbelltown.

A tree occasionally 50 feet high.

It is a very fragrant plant; does well in the Sydney district.

L 6 (Sydney Botanic Gardens).

(5.) *C. Lawsoniana*, Murray. "Lawson's Cypress."

Figured in *Bot. Mag.* t. 5581.

The tallest of all Cypresses, attaining a height of 150–200 feet in its native country,—South Oregon and North California.

"It is polymorphous, giving rise to varieties so distinct from the normal form, and so varied in habit and outline, that several of them are justly ranked among the best of subjects for the geometrical or formal flower garden, both in summer and winter. It may be used for almost every purpose for which Conifers are planted—as a single specimen for the lawn or park, in groups of its own kind, or intermixed with other trees or shrubs, for evergreen hedges, or as a funeral or cemetery tree."—(Veitch's Manual.)

It tolerates Sydney, but does far better in cold, moist localities. It is very sensitive to drought.

L 6 (Sydney Botanic Gardens).



Cupressus Goveniana, Gordon (*C. Californica*, Carr.), old plant.

Botanic Gardens, Sydney.

(6.) *C. lusitanica*, Miller. "Cedar of Goa." (Syn. *C. glauca*, Lam.)

A medium-sized tree of 40-50 feet. A native of South Europe, perhaps of Portugal, and certainly not of Goa.

A handsome species, which does very well in the Sydney district.

L 6 (Sydney Botanic Gardens).



Cupressus lusitanica, Miller.
Botanic Gardens, Sydney.



Cupressus sempervirens, L.
Palace Gardens.

(7.) *C. Macnabiana*, Murray.

Sargent, 109, t. 528.

A medium-sized tree, with rather coarse foliage. A native of California at a considerable elevation, and quite hardy in Britain. It is said to be readily distinguishable from every other species, and seems worthy of attention. It used to be grown in the Sydney Botanic Gardens, and should be tried again. Our plants were quite small shrubs, very slow growing.

(8.) *C. macrocarpa*, Hartweg. "Monterey Cypress."

Figured by Sargent, t. 525.

A tree attaining a height of 50 feet and more, and large-fruited, as its name denotes. It is a native of South California, near the sea. It grows freely in the young state, and is a handsome plant. In its native country it is like the cedar of Lebanon in shape when old.

In the warmer parts of New South Wales, including Sydney, it is very liable to attack by borers, and hence is not to be recommended for a permanency. It was very extensively planted in the Sydney district at one time, but is now rare there. It does better in the Blue Mountains, but it is not a safe plant.

The variety known as *C. Lambertiana*, Carr., is a far better form in our experience—far safer, and far more durable. It is not attacked by the borer so much as typical *macrocarpa*, and is the form usually planted for *macrocarpa*, as being decidedly more generally useful in this State.

L 1 (Sydney Botanic Gardens).

(9.) *C. nootkatensis*, Don. "Nootka Sound Cypress" (of Britain). "Yellow Cypress" (of America).

Figured by Sargent, t. 530.

A large tree, attaining a height of over 100 feet.

It is a native of Oregon and British Columbia. While somewhat variable in habit, it is by no means so variable as the closely-allied *C. Lawsoniana*.

With us, a small-growing species.

U 3 a; also its var. *variegata* (Sydney Botanic Gardens).

(10.) *C. obtusa*, Koch. "Japanese Cypress."

Figured in Veitch's Manual.

A tall tree in its native country, attaining as much as 100 feet. It is a variable species, and many of its varieties are under cultivation, being usually known in British gardens as *Retinospora*, and in Continental ones as *Chamaecyparis*.

It is a tree held sacred by the followers of the Shinto faith, whose temples are built exclusively of its timber, and it is largely cultivated around the temples. It is much esteemed for lacquer ware. It is one of the species dwarfed by the Japanese.

It is not entirely happy in the Sydney district.

L 11 a; var. *argentea*, L 11 a (Sydney Botanic Gardens).



Cupressus torulosa, Don.
Botanic Gardens, Sydne

(11.) *C. pisifera*, Koch. "The Pea-fruited Retinospora" or "Japanese Cypress."

A smaller and more slender tree than *C. obtusa*, with which it is everywhere associated in Japan. Like *obtusa*, it is somewhat variable.

It does fairly well in the Sydney district, being a much stronger plant than the preceding.

M 19, L 11 a; var. *squarrosa*, L 7 a (Sydney Botanic Gardens).

(12.) *C. sempervirens*, L. "Roman Cypress."

"A tree of variable height and habit, but usually recognisable in two distinct forms: the one with spreading branches and of broadly pyramidal or conical outline, but in old age with an open head and of irregular outline; the other with upright branches more or less appressed to the trunk and to each other, forming a flame-shaped or columnar tree of dense aspect."—(Veitch's Manual.)

Common throughout the Mediterranean region.

This cypress is a very long lived tree, and some specimens attain a great size. Its timber also is proverbially durable.

The fastigiate form is sometimes known as *C. fastigiata*.

L 7, 8, 17, 20 (Sydney Botanic Gardens), and the more horizontal form as *C. expansa*. L 5 (Sydney Botanic Gardens).

Both forms do well in Sydney in good soil.

(13.) *C. thurifera*, H.B.K.

A tree of 50 feet and more. Native of Mexico, and apparently suited to New South Wales, since it does fairly well in the Sydney Botanic Gardens.

L 9 (Sydney Botanic Gardens).

(14.) *C. thyoides*, L. "White Cedar" (of the United States and England).

Figured by Sargent, t. 529.

Native of the eastern United States, where it inhabits coastal swamps. A tall, slender tree of 70–80 feet. The leaves are used to make Cedar-leaf oil.

It does fairly well in the Sydney district.

L 8, 9, 11a (Sydney Botanic Gardens).

Var. *ericoides* is a dwarf form, about 5 feet high with us.

L. 33 D.

Var. *variegata*.

L 8 (Sydney Botanic Gardens). This has been a very handsome plant in its day, but it is getting old now.

(15.) *C. torulosa*, Don. "Bhotan Cypress."

A large tree, attaining a height of 70–80 feet. Native of the Himalayas.

It does fairly well in the Sydney district.

L 6, 8, 33 e (Sydney Botanic Gardens).

A variegated form at L 6 (Sydney Botanic Gardens).

The variety *Corneyana*, whose native country is uncertain, has branches and branchlets pendulous. The umbos of the scales are less or not at all developed.

It also does well in the Sydney district. It is not so "stiff" looking as the type form.

L 29 c (Sydney Botanic Gardens).

4. *Thuia* (including *Thujaopsis*)—often spelt *Thuja*.

"The *Thuias*, with one exception, *T. gigantea*, are medium-sized or low evergreen trees of narrowly conical outline; or dense globose, fastigate, or dwarf shrubs that have deviated under cultivation from the ordinary habit of the species. As here understood, the genus includes five species inhabiting a belt in the north temperate zone, extending with interruptions through North America and Asia, between the 30th and 50th parallels of north latitude."—(Veitch's Manual.)

(1.) *T. dolobrata*, L.f. The "Akeki" of Japan.

A tree or undershrub used as an avenue tree in China and Japan. The wood is very durable, and is used for many purposes; the bast is made into ropes.

It is scarcely suitable for a dry climate, as it is liable to die suddenly during a spell of warm, dry weather.

L 2 a (Sydney Botanic Gardens).

(2.) *T. gigantea*, Nuttall. "Western *Arbor Vitæ*; the Red or Canoe Cedar of Oregon."

The tallest of all the *Thuias*, attaining a height in its native country (British Columbia, northern California, &c.) of 200 feet. It flourishes best in rich river valleys.

It is a very handsome species, and it yields a valuable fissile timber. It certainly ought to be added to the number of the Conifers to be planted as extensively as convenient in the colder parts of New South Wales.

We have had it in the Sydney Botanic Gardens from time to time, but it does not last in the Sydney climate.

(3.) *T. occidentalis*, L. "*Arbor Vitæ*." Called White Cedar in the United States and Canada.

It is a tree of medium size, very common in swamp land in Canada and the north-eastern United States. Like other Conifers, it varies much in size according to soil and climate.

It is, probably, the first American Conifer introduced into Great Britain and is a most useful plant, although it has had to submit to the competition of many Conifers from different parts of the world.

Its leaves have been used as a remedy for rheumatism on account of their sudorific properties. Its wood is used for posts and similar purposes, on account of its durability. It forms a fine hedge.



Thula dolobrata, L. f.
Botanic Gardens, Sydney.

Leaves used in the manufacture of Cedar-leaf oil, according to Schimmel.

It does indifferently well in Sydney.

It is a very variable species, and a large number of forms of it have been named.

var. *aurea* ; var. *variegata*.

U 8 b, L 35 b (Sydney Botanic Gardens).

var. *plicata*, L 11 a, 26 c, 30 a.

(4.) *T. orientalis*, L. "Chinese Arbor-Vitæ."

This is a low tree of columnar or pyramidal habit, often a dense shrub of broadly conical or globose outline.

It is very variable, and many different forms have received special names.

Its geographical range is somewhat uncertain ; it probably extends from northern China to Persia.

L 7.

var. *aurea*, U 6, L 13, 29 c, 34 a.

var. *elegantissima*, M 29.

var. *filiformis*, L 11 a.

var. *intermedia*, L 27 c, 33 c, 35 b, 12, 15 b, 18.

var. *pendula* (Syn. *T. filiformis*, Lodd.), L 11 a.

var. *sempervirens*, M 19. (Sydney Botanic Gardens.)

5. Libocedrus.

A genus of evergreen trees of Thuia-like aspect, mostly with spreading branches and flattened branchlet systems. The narrow pear-shaped fruit of the genus is a character.

(1.) *L. chilensis*, Endl. "Chilian Arbor-Vitæ."

A medium-sized tree of pyramidal outline.

"It is common in some of the valleys and along the lower slopes of the Chilian Andes, from Valparaiso southwards to Valdivia. The wood is soft and easy to work, and is highly valued by the inhabitants for indoor carpentry on account of its fragrance."—(Veitch's Manual.)

It is stated rarely to escape injury in Britain in severe winters, and is one of the species which should be thoroughly tested in the colder parts of New South Wales. In the Sydney district it objects to the spells of hot, dry weather.

(2.) *L. decurrens*, Torrey. "Californian White or Incense Cedar."

A lofty, stately columnar tree of 100–150 feet, under favourable conditions, Native of California, attaining its greatest development between 3,000 and 7,500 feet.

Through an unfortunate confusion of botanical material, this species has been much mixed up with *Thuia gigantea*.

This beautiful species should be well tested in New South Wales.

(3.) *L. Doniana*, Endl. The "Kawaka."

A forest tree of about 50 feet and more, found in the North Island of New Zealand from Mongonui southwards to Hawke's Bay and Taranaki, from the sea-level to 1,000 feet.

It is not abundant, but its timber is much appreciated for ordinary building purposes.

Garden Palace Grounds.

(4.) *L. Bidwillii*, Hook. f. "Pahautea" or "New Zealand Cedar."

Very similar to the preceding species, but usually smaller; a shrub in sub-alpine localities.

Found in the North and South Islands of New Zealand, from Te Aroha Mountain and Mount Egmont southwards to Foveaux Strait.

"Often confounded with *L. Doniana*, but the obviously tetragonous branchlets of the mature tree, with almost uniform leaves, are characteristic and readily distinguish it."—(Cheeseman.)

Not in the Sydney Botanic Gardens.

(5.) *L. tetragona*, Endl.

An interesting Conifer from the western slopes of the Andes of southern Chili. It inhabits the same region as *Fitzroya patagonica* and the foliage of the two trees is much alike, so that the two trees have become confused by travellers who have not closely examined them.

"The climate of the region it inhabits is one of the most equable, and also one of the most humid in the world; for upwards of six months of the year rain falls daily, and on rainless days the sky is sometimes overcast for weeks together; the average summer temperature is about the same as that of Great Britain, but the mean winter temperature is higher."—(Veitch's Manual.)

Tribe—TAXODINEÆ.

6. *Athrotaxis*, Don.

A genus of three species endemic in Tasmania and confined to the Western Mountains.

A. laxifolia is the most restricted, being only recorded from the Field Range, near La Perouse.

Leaves 1-2 lines long.

Leaves closely pressed to the stem, very obtuse *A. cupressoides*.

Leaves looser, acute *A. laxifolia*.

Leaves 3-4 lines long *A. selaginoides*.

These Pines are handsome trees, and are worthy of cultivation in the coldest parts of New South Wales.

The genus is of special interest from a palæobotanical point of view.



Thuia orientalis, L., var. aurea.
State Nursery, Campbelltown.



Cryptomeria japonica, D. Don.
Federal Government House, Sydney.

(1.) *A. cupressoides*, Don. The true "King William Pine."

A tree which is often irreverently called in Tasmania simply "King Billy."

A small erect tree of 40 feet.

(2.) *A. laxifolia*, Hook. f.

Very much like the preceding in habit.

(3.) *A. selaginoides*, Don.

"Red Pine," because of the colour of the wood. The name is often applied to the other species. The tree is sometimes also called "King William Pine."

A small erect tree, extensively but symmetrically branched, 40-50 feet high. (Rodway.)

7. *Cryptomeria*.

A monotypic Japanese genus of considerable palaeobotanical interest.

(1.) *C. japonica*, D. Don. The "Sugi" or "Japanese Cedar."

A stately tree, attaining a height of over 100 feet in its native country. The avenue of Nikko is one of the most celebrated in the world.

It has been very extensively cultivated in Japan and many parts of the world, and a number of horticultural varieties are recognised. It does well in many parts of New South Wales. Its timber is very extensively used for box-making and miscellaneous purposes in Japan. No wood is more largely used in that country.

L 6 a (var. *Lobbii*), M 19 (Sydney Botanic Gardens).

8. *Sequoia*, Endl.

This genus, comprising two noble American trees, also includes a few well-marked fossil species.

(1.) *S. sempervirens*, Endl. The "Californian Redwood."

Figured by Sargent, t. 535.

Confined to the Pacific littoral from the southern boundary of Oregon to a little below Monterey in southern California.

A gigantic tree, attaining a height of 180-250 feet, with a diameter near the base of 12 to 18 or more feet.

Professor Sargent, in his "Silva of North America," says:—"The Redwood (*Sequoia sempervirens*), which is the tallest American tree, probably occasionally attains the height of 400 feet and more. The tallest specimen I have measured was 340 feet high. Among American trees the redwood is exceeded in size only by *Sequoia Wellingtonia*."

It grows in rather dry situations, but it attains its best development in areas enveloped with ocean fogs.

This is the tree that yields the Californian Redwood so largely imported into this State. It is a soft, light, easily worked, durable, not readily inflammable timber, not liable to warp.

M 19, L 1, 2, 7 a, 11 (Sydney Botanic Gardens).

(2.) *S. Wellingtonia*, Seem. The "Big tree" of the United States. Figured by Hooker, *Bot. Mag.* tt. 4777, 4778; Sargent, t. 536.

The largest tree in the world.

Professor Sargent says:—"Its average height is about 275 feet and its trunk diameter near the ground 20 feet, although individuals from 300 feet to 320 feet tall, with trunks from 25 feet to 35 feet thick, are not rare." Speaking of the celebrated Calaveras trees, he says:—"In the Calaveras grove there are three trees over 300 feet high, the tallest measuring 325 feet. The largest tree measured is standing in King's River forest, and 4 feet above the ground has a diameter of 35 ft. 8 in. inside the bark."

"In Great Britain the *Wellingtonia* is characterised by extreme formality of habit, which is that of a spire or elongated cone, its outline scarcely broken by a projecting branch."—(Veitch's Manual).

In U 6, southern side (Sydney Botanic Gardens) is a small specimen of this interesting tree. The Sydney climate is, however, too warm for this species.

9. *Taxodium*, L. C. Richard.

This genus of two species is commonly called "the Deciduous Cypress."

It is represented in bygone geological ages.

(1.) *T. distichum*, L. C. Richard. "Deciduous Cypress." "Bald or Swamp Cypress" of the Americans.

Figured by Sargent, t. 537.

A large deciduous tree, attaining its greatest development in Mexico, but abundant between the 39th parallel of north latitude and the Gulf of Mexico, and extending from the Atlantic Ocean westward to the 98th meridian.

There is a smaller form, var. *pendulum*, figured in *Bot. Mag.* t. 5603.

This noble tree does well in the Sydney district and in our coastal lands generally (*e.g.*, it does well with Mr. P. H. Morton, near Berry), in moist bottoms, preferably liable to inundation.

From the large spreading roots, which are often near the surface, numerous "knees" spring out, which give the trees a singular appearance, and have, doubtless, allied functions to those of the pneumatophores of the mangroves. For an illustration of a Syon House tree (near London) showing the "knees," see Veitch's Manual.

M 19 (Sydney Botanic Gardens).

(2.) *T. mucronatum*, Ten. (*T. mexicanum*, Carr.), is a variety of *T. distichum*. It does very well in Sydney.

U 7, L 1, 18 (Sydney Botanic Gardens).



Sequoia sempervirens, Endl.
State Nursery, Campbelltown.



Taxodium mucronatum, Ten.
Botanic Gardens, Sydney.

10. *Sciadopitys*, Sieb. and Zucc.

A monotypic genus confined to one district of Japan.

“Like the Ginkgo, it stands alone amidst the existing vegetation, so that if the hypothesis of its great antiquity has any real foundation, a whole series of forms which once connected it with other types must have been swept away, leaving the *Sciadopitys* as the sole survivor of a phase of vegetation long since extinct.”—(Veitch’s Manual.)

(1.) *S. verticillata*, Sieb. and Zucc. "Umbrella Pine."

See Sieb. and Zucc., *Flora Japonica*, ii, tt. 101, 102; also Veitch's Manual.

Has been cultivated from time immemorial by the Japanese around their temples. In its greatest development it attains a height of 100 feet.

It is a beautiful and singular-looking tree. It is remarkable for the verticillate rays of "cladodes," or foliage of peculiar structure. The leaves are scale-like, of deltoid shape, and soon falling off; from the axils of these arise the phylloid shoots or cladodes, which perform the functions of true leaves.

Every connoisseur, suitably circumstanced, should endeavour to grow this remarkable tree. It grows in the Sydney Botanic Gardens (M 25), but does not flourish. It does not appear to be thoroughly happy in Britain. Veitch's Manual states that "where the *Rhododendron* thrives the *Sciadopitys* will grow. This means that the soil in which the *Sciadopitys* is planted must be sufficiently retentive to afford a constant supply of moisture to the roots during the growing season; where this supply is intermittent, that is to say, when the *Sciadopitys* is planted in a soil that is sometimes dry and sometimes wet, according to the changes of weather, it does not thrive."

Tribe—ARAUCARINEÆ.

These plants mostly do well in the Sydney and warmer coastal districts, and some of them (*e.g. A. Bidwilli*) are displaying considerable powers of accommodation to colder districts.

11. *Cunninghamia*, R.Br.

A monotypic genus, of geological antiquity. "Remains of cones and foliage closely resembling those of the living species have been found in the lower Tertiary strata." (Veitch's Manual.)

(1.) *C. sinensis*, R.Br.

See Hook., *Bot. Mag.* t. 2743; also Sieb. and Zucc., *Flora Japonica* ii, tt. 103, 104.

A handsome, medium-sized tree from South China. In Britain "the foliage of more than one year's standing is invariably more or less discoloured, probably from a combination of causes, which has proved a drawback to its use as an ornamental tree in this country." (Veitch's Manual, p. 292.)

The same conditions apply here in the limited experience we have of it. It also loses much of its foliage at certain seasons. At the same time, as a young tree, it is a very beautiful object, and should certainly be tried by any lover of Conifers in the coastal districts and coastal ranges. Like many other Conifers we want experimental planting in as many districts of New South Wales as possible, and I am certain we are in for many pleasant surprises.

M 25* (Sydney Botanic Gardens).

* These numbers refer to the "Guide (with plan) to the Sydney Botanic Gardens," 8vo., pp. 108; price 6d., postage 2d. extra.

12. *Agathis*, Salisbury (Syn. *Dammara*, Lambert).

(1.) *A. australis*, Salisb. (*Dammara australis*, Lambert.) "Kauri Pine.

Peculiar to the North Island of New Zealand. The well-known timber-tree, yielding also a valuable recent and fossil resin called Kauri Gum. See Kirk's "Forest Flora of New Zealand." It does not do well in such soil and conditions as we are able to give it in the Botanic Gardens. I do not know an old tree in the Sydney district.

(2.) *A. robusta*, Mast. (*Dammara robusta*, C. Moore). "Queensland Kauri" or "Dundathu Pine."

A very tall tree in dense forest country, chiefly near Wide Bay, Queensland; a broad-foiled species. It grows fastest and the tallest of all species of *Agathis* in eastern New South Wales.

U 2 K, M 17, L 19 (Sydney Botanic Gardens).

(3.) *A. Palmerstoni*, F.v.M. "Cairns Kauri Pine."

A tall tree from Northern Queensland, considered to be nearest to *A. Moorei*. The leaves are much smaller than those of *A. robusta*.

It is worth trying in good soil in the North Coast districts. It is not in the Sydney Botanic Gardens at present.

(4.) *A. Moorei*, Mast. (*Dammara Moorei*, Lindl.). See *Journ. Hort. Soc.*, 1851.

New Caledonia. In the Sydney district it forms a compact growth, and is the handsomest of the species with us.

M 17 (Sydney Botanic Gardens).

(5.) *A. ovata* n. sp.* (*Dammara ovata*, C. Moore), ex Gordon, *Pinetum Suppl.* 28. (See also Gordon's *Pinetum*, 1880 edition, p. 112.)

New Caledonia. A tree of medium size, allied to *A. Moorei*, but smaller than that species, and of slower growth in the Sydney district.

M 17, 28 (Sydney Botanic Gardens).

(6.) *A. obtusa*, Mast. (*Dammara obtusa*, Lindl.).

A broad-foiled species after the *robusta* type, from the New Hebrides. Only does fairly well in the Sydney district so far.

There is no doubt that it would do far better given good soil, shelter, and room to spread and make a tree. This remark applies to most of the species of *Agathis* in the Sydney Botanic Gardens, which are crowded with other plants.

M 17, L 25 b (Sydney Botanic Gardens).

(7.) *A. vitiensis*, Mast. (*Dammara vitiensis*, Seem.). Mueller says it is probably identical with *D. longifolia*, Lindl. The "Dakua" of Fiji.

A noble Kauri Pine, figured in Seemann's *Fl. Vitiensis*. It yields resin, as well as a useful timber.

Does very well in the Sydney district, and fruits abundantly, though it does not produce fertile seeds. It is, of course, from a tropical country, and does not attain full development here.

M 17 (Sydney Botanic Gardens).

* This species-name does not appear to have been previously employed by botanists.



Agathis Moorei, Mast. Botanic Gardens, Sydney.

N.B.—There is a *Prumnopitys* at the back, giving the Agathis a more dense foliaged appearance than it really has.



Araucaria excelsa, R.Br.

The so-called "Wishing Tree" in the centre of the Middle Garden, Sydney Botanic Gardens.



Araucaria Bidwilli, Hook.

Camden Park, N.S.W.

(8.) *A. branthifolia*, Salisb. (*Dammara orientalis*, Lamb.) "Amboyna Pine." See *Bot. Mag.* t. 5359.

Native of the Moluccas. Yields the well-known resin called "Dammar."

Tender in the Sydney district, and doing fairly well with us. It certainly should be tried in north-eastern New South Wales.

M 17 (Sydney Botanic Gardens).

13. *Araucaria*, Jussieu.

Confined to temperate South America, Eastern Australia, and the Pacific Islands. A most desirable group of plants for coastal New South Wales.

(1.) *A. Bidwilli*, Hook. The "Bunya Bunya."

Native of South Queensland. A large tree which does well in the coast districts in good, deep soil, with shelter. It is creeping inland. It is a very handsome and desirable tree for the middle of a plantation. The large seeds were formerly used as food by the aborigines.

L 7, 15, 35 (Sydney Botanic Gardens).

(2.) *A. Cunninghamii*, Ait. "Moreton Bay or Richmond River Pine."

Our one New South Wales *Araucaria*, and, in my view, a beautiful species. Like most species of this genus, its branches are verticillate, and it carries the greater number of its leaves towards the ends of them, which gives to it a somewhat unusual tufted appearance. The bark, which is somewhat thin in young specimens, and deciduous, leaves the tree, not in longitudinal, but in vertical strips. The natural habit of this tree can be altered to some extent by a judicious use of the pruner, in cutting back the ends of the longest branches, and so inducing a back growth, which has the effect of a compacter habit. Great care requires to be exercised in the operation.

This tree yields a large proportion of the White Pine timber used in this State. It is, however, inferior to the best American and Baltic timbers.

M. 25, L 8 (Sydney Botanic Gardens).

Var. *glauca* (*A. glauca*, Antoine). See *Gard. Chron.*, 1888, 685, fig. 90.

The botanical position of this tree demands further inquiry, and its difference, if any, from the New Guinea *A. Beccari*, Warburg, requires thorough investigation.

Wide Bay district of Queensland and coastal Queensland generally.

It does not make a very handsome tree in Sydney, being much stiffer growing than the normal species, but it is well worthy of extended trial in the warmer coast districts.

L 23 g (Sydney Botanic Gardens).

(3.) *A. excelsa*, R.Br. "Norfolk Island Pine."

Native of Norfolk Island, as its name denotes.

Largely used in New South Wales for planting in the vicinity of the sea for shelter and other purposes. A very hardy tree in the coastal districts, and often planted as a specimen tree. It does well in the Sydney district, and is, indeed, the most popular member of the genus for general planting in coastal New South Wales.

U 3, 8; M 13, 18; L 1, 8, 13, 18, 22, 29 (Sydney Botanic Gardens).



Araucaria Cookii, R.Br.

Federal Government House, Sydney.



Araucaria Rulei, F.v.M.
Garden Palace Grounds, Sydney.

(4.) *A. Cookii*, R.Br. "Captain Cook's Pine."

Figured as *A. columnaris*, Hook. in *Bot. Mag.* t. 4635. See also *Nouv. Arch. du Muséum*, t. vii, pl. 14.

The foliage is very similar to that of the Norfolk Island Pine, but its habit is very different.

Native of New Caledonia and the New Hebrides. A handsome species which does well in the Sydney Botanic Gardens, *e.g.*, M 7, 17, 19; L 7. There are some fine specimens at Bondi, Ryde, and other places.

Certain horticultural varieties are recognised, *e.g.*, vars. *pendula*, *Raoulei*, *rigida*.

(5.) *A. Rulei*, F.v.M. "Rule's Pine." See Lindley in *Gard. Chron.*, 1861, p. 861, with figures (the original drawings of the species); also *Nouv. Arch. du Muséum*, t. vii, p. 16.

Native of New Caledonia.

Resembles the Chili Pine (*A. imbricata*) a good deal in external appearance. It is worthy of further experiment, especially along the North Coast, for it was reported by its discoverer in language indicating its superlative beauty. It will not stand exposure.

U 8 d (Sydney Botanic Gardens).

(6.) *A. Balansæ*, Brongn. and Gris. The "Balansa Pine." New Caledonia. See *Nouv. Arch. du Muséum* (Paris), t. vii, pl. 13; also *Ill. Hort.*, 1875, t. 204; 1894, t. 197, for figures.

Sydney is rather cold for it, and it apparently wants better soil for its full development than we are able to give it in the Botanic Gardens. One of our trees is about 20 feet high.

The late Mr. Charles Moore distributed this Pine under the unpublished name of *A. elegans*, which I have ascertained from specimens here.

M 21, 25; L 1 (Sydney Botanic Gardens).

(7.) *A. montana*, Brongn. and Gris. *Nouv. Arch. du Muséum*, t. vii, pl. 14.

New Caledonia. Not in Sydney at the present time.

(8.) *A. Muelleri*, Brongn. and Gris. *Nouv. Arch. du Muséum*, t. vii, pl. 15, 16. Also *Ill. Hort.*, vol. 29, pl. 449.

A handsome, coarse-foliaged species. Not in Sydney at the present time.

(9.) *A. imbricata*, Pavon. "Chili Pine" or "Monkey Puzzle."

A tall tree attaining a height of 100 feet under favourable circumstances, native of South Chili, and well known for its dark, handsome, rigid, lance-like foliage.

It grows, but does not flourish, in the Sydney district; it does well in many of the cooler parts of the State.

(10.) *A. brasiliensis*, A. Richard.

A tree of 70–80 feet, native of the mountains of Southern Brazil.

Much cultivated along the Mediterranean littoral of France and Italy, but it does not appear to be in Sydney at the present time.

Of the coarse-foliaged species it does better in Sydney than *A. imbricata* and not so well as *A. Bidwilli*.

Tribe—ABIETINÆ.

Sub-tribe 1.—*Pinææ*.14. *Pinus*.Sub-tribe 2.—*Laricææ*.15. *Larix*.17. *Cedrus*.16. *Laricopsis*.Sub-tribe 3.—*Sapinææ*.18. *Picea*.20. *Abietia*.19. *Tsuga*.21. *Abies*.Sub-tribe 1.—*Pinææ*.**14. *Pinus*.**

Over 70 species of this well-defined genus have been described. Not many of them are at their best in the Sydney district, but most of them will undoubtedly do well in one part or other of New South Wales. At present we confine our attention, in this State, almost exclusively to *P. radiata* (*insignis*), *Pinaster*, *pineæ*, and *halepensis*, and exhibit too little enterprise in trying other species of this beautiful, health-promoting and interesting genus. The seed is quite cheap, and can readily be imported if local seedsmen do not have that of any particular species in stock.

(1.) *P. Ayacahuite*, Ehrenberg. The "Ayacahuite" of Mexico. The common "White Pine" of Mexico.

A graceful Pine, tender in many parts of Britain, and probably quite hardy in parts of New South Wales.

(2.) *P. canariensis*, Ch. Smith. "Canary Pine."

Native of the Canary Islands. See *Gard. Chron.* 1888, iii, 723, f. 94.

A beautiful long-leaved Pine which does well in comparatively dry situations and calcareous soils. It does only indifferently well in Sydney, but is a very useful tree in many parts of the State.

L 7, 17, 32 (Sydney Botanic Gardens).

(3.) *P. Cembra*, L. "Swiss Pine."

This is a cold country Pine which just exists in the Sydney district. It should be well tried in the coldest regions.

(4.) *P. cembroides*, Zucc. (*P. fertili*, Roehl.) "Mexican Swamp Pine."

The seeds are edible. We have not been very successful with this tree in the Sydney district, but steps are being taken to give it a further trial.

It will probably be found suitable in cooler situations.

L 30 b (Sydney Botanic Gardens).

(5.) *P. contorta*, Douglas. "Oregon Scrub Pine."

Is a small scrubby tree which inhabits the sandy dunes and exposed promontories of the Pacific Coast from Mendocino northwards to Alaska. It may be added to the list of trees and shrubs more or less useful for covering sand-dunes and preventing land slips, and is listed here with that view.



Pinus canariensis, Ch. Smith.
Botanic Gardens, Sydney.

(6.) *P. Coulteri*, Don. "Coulter's Pine."

A large tree, remarkable for its very large cones. It does fairly well in the Sydney district (better at Campbelltown), and in many cooler parts of New South Wales, but in our experience it is not dense-foliaged and hence not very popular. At the same time further experiments should be made with it.

(7.) *P. densiflora*, Sieb. and Zucc. "Akamatsu Pine." See Sieb. and Zucc., *Flora Japonica*, ii, 22, t. 112. Japan.

This Japanese Pine has never done well in the Sydney Botanic Gardens. It requires colder localities and is worthy of extended trial.

(8.) *P. excelsa*, Wallich. "Himalayan Pine." "Lofty or Bhotan Pine." Temperate Himalaya.

This tree has been tried in the Sydney Botanic Gardens for many years, but it always suffers during the droughts of summer. It is a beautiful and a very large tree and can be confidently recommended for cool localities where good soil is available.

L 15 b, 29 c (Sydney Botanic Gardens).

(9.) *P. halepensis*, Miller. The "Jerusalem or Aleppo Pine." See *Gard. Chron.* 1884, xxii, 553, f. 97; 1888, iii, 629, f. 84.

Native of South Europe to Afghanistan.

A tall tree, but, in the Sydney district, liable, during the last few years, to an insect disease (a Coccid, *Dactylopus sp.*) which has almost thrown it out of cultivation.

It prefers calcareous soil, and a drier climate than Sydney. It does admirably in Adelaide and many parts of South Australia, and will flourish in many parts of our State also.

In its best development it is a very large, handsome tree, with large branches of very dense foliage.

L 7, 33, 35 (Sydney Botanic Gardens).

(10.) *P. Hartwegii*, Lindl. (Syn. *P. Ehrenbergii*, Enll.) Mexico.

This has never made a good plant in the Sydney Botanic Gardens, being always thin and spindly. It should be more thoroughly tested in New South Wales.

(11.) *P. heterophylla*, Ell. "Cuban Pine."

Prof. B. E. Fernow says that this species is in the very first rank of timber pines in the United States.

It should therefore be given a thorough trial here.

(12.) *P. Koraiensis*, Sieb. and Zucc. "Corean Pine."

Native of Corea, China, and Japan.

For a figure of the remarkable and handsome cone, see *Veitch's Manual*. It is often planted in Japan, where it attains imposing dimensions.

Sydney is too warm for it, and it is hence a poor grower in the Sydney Botanic Gardens; but it should certainly find a place in gardens and plantations in colder districts.

L 15 b (Sydney Botanic Gardens).



Pinus Coulteri, Don.
State Nursery, Campbelltown.



Pinus excelsa, Wallich.
State Nursery, Campbelltown.



Pinus Laricio, Poiret.
State Nursery, Campbelltown.

(13.) *P. Lambertiana*, Dougl. "Sugar Pine."

Native of California, Oregon, and British Columbia.

Sargent, tt. 542, 543.

A gigantic tree in its native country, being the loftiest of all pines, attaining a height of 300 feet.

It yields a well-known and valuable timber, and Professor B. E. Fernow classifies it as one of the best timber pines in the United States.

The Sydney district is too warm for it, but it is certainly a valuable tree for the cold districts.

L 5 (Sydney Botanic Gardens).

(14.) *P. Laricio*, Poir. "Corsican Pine." "Larch Pine."

Native of South Europe and the Levant.

The most useful tree for general forestry planting in Great Britain.

It does fairly well in Sydney. Our tree has been a good specimen, but it is now past its prime. This pine should be well tested in the coast districts.

L 7 (Sydney Botanic Gardens).

Var. *austriaca* (*P. austriaca*, Höss). "Austrian Pine."

It is a smaller and more inland tree than the preceding, and promises best away from the coast.

L 17 (Sydney Botanic Gardens).

(15.) *P. longifolia*, Roxb. "Emodi Pine." Himalaya, India.

A tall tree, remarkable for its beautiful, long, pendulous leaves. It does fairly well in the Sydney district, and should be well tried in the coastal districts and eastern slopes.

L 17, 29, 35 (Sydney Botanic Gardens).

(16.) *P. Massoniana*, Lambert.

China. Timber used for tea-boxes. This is a tree which does fairly well in the Sydney district, and if it be given a fair chance, with fair soil, there is no doubt it will prove a useful Pine for New South Wales.

L 7 (Sydney Botanic Gardens).

(17.) *P. mitis*, Michx. (Syn. *P. echinata*, Miller.) "Short-leaved Pine." "Soft-leaved Pine" (England), and "Yellow Pine" (United States). Sargent, t. 587 (as *P. echinata*, Miller).

Native of the Eastern United States, where it is widely diffused. It yields a valuable timber, and has the merit of rapidly reforesting worn-out fields, thus enabling a crop of timber to be raised while the soil has an opportunity of recovering its fertility.

Professor B. E. Fernow, the eminent exponent of forestry in the United States, speaks of this species as being one of the best pines of that country.

For that reason it should well be tried in this State. It has been tried in Sydney and has not done well so far, but residents in the coldest districts should experiment with it.

L 15 b (Sydney Botanic Gardens).

(18.) *P. Montezumae*, Lambert.

The common Pine of the mountains and highlands of Mexico, between the 17th and 25th parallels of north latitude. It is a beautiful species, very



Pinus longifolia, Roxb.
State Nursery, Campbelltown.

distinct, tender in Britain and Ireland, and may be expected to flourish in many parts of New South Wales.

It is not in the Sydney Botanic Gardens at present.

(19.) *P. muricata*, D. Don. "Bishop's Pine" (corruption of Obispo Pine).
"Prickle-coned Pine." Sargent, tt. 585, 586.

A maritime Pine found wild only in the vicinity of the Californian coast exposed to the fogs and winds of the Pacific Ocean.

Our experience shows that this Pine has not been a success in the Sydney Botanic Gardens. It is, however, worthy of additional experiments, and should be thoroughly tested along the South Coast. It is a small-leaved, dense-growing species, and its real value for New South Wales remains to be ascertained.

(20.) *P. palustris*, Miller. "Long-leaved Pine," "Southern Pitch Pine," "Southern Yellow Pine," "Yellow Broom Pine." Sargent, tt. 589, 590.

A medium sized or tall tree.

Pinus palustris is almost the sole ingredient of the immense forests stretching uninterrupted along the Atlantic seaboard from south-east Virginia to the Everglades in Florida, and also along the northern littoral of the Gulf of Mexico as far as Trinity Valley in South Texas. This belt, known in the United States as the Southern "Pine Barrens," varies from 80 to 125 miles in breadth in the Atlantic States, but is much narrower along the Gulf coast; it is estimated to have once covered upwards of 130,000 square miles, an area greater than that of Great Britain and Ireland, and to have represented an amount of wealth which, if properly husbanded, would have made the States of South Carolina and Georgia among the richest in the Union. But, "invaded from every direction by the axe, a prey to fires which weaken the mature trees and destroy the tender saplings, wasted by the pasturage of domestic animals, and destroyed for the doubtful profits of the turpentine industry, the forests of Long-leaved Pines appear hopelessly doomed to lose their commercial importance at no distant day."*

It is by far the most valuable Pine of the Atlantic States, and still the most abundant. It supplies nearly the whole of the turpentine, pitch, tar and resin of American commerce as well as for home consumption, and its timber is used for all sorts of constructive purposes, including ship-building, house carpentry, fencing, railway ties, etc. (*Veitch's Manual*, p. 353.)

See "Waste in Logging Southern Yellow Pine," by J. Girvin Peters, *Year-book, Dept. Agric. U.S.A.*, 1905.

Prof. B. E. Fernow says it is one of the best Pines of the United States.

It is too tender for Great Britain, and is a species well worthy of attention in coastal New South Wales. It promises well; for example, there is a fine specimen in the National Park, sent out by the Botanic Gardens, Sydney, and further tests are being made in the Botanic Gardens.

(21.) *P. patula*, Schiede.

A large tree, native of Central Mexico. It is "one of the most ornamental of Pines," rather tender for Great Britain, and should have more extensive trial here. Up to the present time it has shown itself a rather slow grower in the Sydney Botanic Gardens, but is full of promise. It was distributed by the Sydney Botanic Gardens some years ago, but reports are not available as to results.

L 32 (Sydney Botanic Gardens).

(22.) *P. Pinaster*, Sol. (Syn. *P. maritima*, Lam.). "Cluster Pine" or "Maritime Pine."

South Europe and the Levant.

Figured and described in Bentley and Trimen's *Medicinal Plants*.

* *Silva of North America*, xi, 156.

An excellent Pine for sea-coast planting. It is the celebrated Pine of the "Landes" of South-western France, so extensively planted to reclaim the sand-dunes, and valuable because of the yield of Turpentine. This tree spreads spontaneously in the Sydney district.

It is undoubtedly a valuable tree for the sandy coast districts. While very useful, it is, however, not one of the most ornamental species.

L 30 (Sydney Botanic Gardens).

(23.) *P. pinea*, L. "Stone Pine." The "Parasol Pine" of the French, owing to the flat tops of mature trees. Often called "Umbrella Pine."



Pinus pinea, L.

State Nursery, Campbelltown.

Mediterranean region. This valuable tree does well in the Sydney district and in the coastal district generally. It attains a very large size, and is one of the Pines which is worthy of attention in any scheme of Australian forestry, involving artificial planting. Because of its flat top it is the most easily recognised of all Pines.

U 3, L 29 a (Sydney Botanic Gardens).

(24.) *P. ponderosa*, Dougl. "Western Yellow Pine." "Bull Pine." Sargent, tt. 560-64.

The western Yellow Pine or *Pinus ponderosa* is the most widely distributed Pine-tree of the mountain forests of western North America, where it spreads from the interior of British Columbia from about latitude 57° N. southwards to Mexico and eastwards to northern Nebraska, the foot-hills of the Rocky Mountains of Colorado and western Texas. Usually an inhabitant of dry elevated slopes, where it often forms open forests of great extent, it flourishes also on the western slopes of the Sierra Nevada in the comparatively humid climate of northern California, where it attains its largest size; and in California it grows occasionally in wet and swampy ground.

A tree of such enormous range over a region of so many different climates has naturally developed many forms, and no other American Pine-tree varies more in size and habit, in the character of the bark, length of leaves and size of cones. Sometimes it is 250 feet high, with a trunk 12 feet in diameter, covered with bright cinnamon-red bark broken into great plates; sometimes it attains with a difficulty a height of 50 feet, and its bark is nearly black and deeply furrowed. Such variations in the character of the bark are not always due to climate, and individuals with the red bark of the Californian tree and the black bark of the inhabitant of the arid slopes of the Colorado mountains stand side by side in northern Arizona, to the discouragement of the botanist anxious to understand this tree and the causes of its variations. One hundred photographs would not be too many to illustrate the appearance of *Pinus ponderosa* in the different parts of the country which it inhabits; and an attempt to describe the different forms with any words at our command would be hopeless. (*Veitch's Manual*, pp. 364-5.)

Prof. B. E. Fernow says that this is one of the best timber Pines of the United States, and that it is well adapted to dry, windy, exposed places. It is evidently a hardy Pine.

This is a species not a great success in Sydney, but hardy in many parts of Britain, but I recommend seed for New South Wales to be, as far as possible, obtained from Californian trees.

The wood of *Pinus ponderosa* varies greatly in quality, strength and durability in different parts of the region over which it is distributed; the wood of the western tree is heavy, hard, strong, and fine-grained, but not durable in contact with the soil. (*Veitch's Manual*, p. 366).

See also "Forest Planting Leaflet," Forest Service Circular 72, U.S. Dept. Agriculture.

L. 30 (Sydney Botanic Garden-).

Var. *Jeffreyi* (*P. Jeffreyi*, Murr.) "Jeffrey Pine." California. See *Gard. Chron.* 1889, v. 361, f. 65.

Distinguished in Oregon from the typical *Pinus ponderosa* by its more pungently aromatic resinous secretions, its stiffer and more elastic leaves, persistent for a longer time; its yellow-green striate flowers, and its larger cones, armed with stronger reflexed prickles. (*Veitch's Manual*, p. 364.)

On the mountain above the Yosemite Valley is a wonderful forest of Pine-trees, composed of *P. ponderosa* var. *Jeffreyi*; the trees stand sometimes close together, sometimes at a considerable distance apart; they are often 250 to 300 feet high, their massive trunks 10 to 12 feet in diameter, and free of branches, except near the top of the tree. There are not many things more impressive or more beautiful than these trunks; the bark is excessively thick, and broken by deep fissures into great armour-like plates, across which the sunlight, as it flickers down through the scanty canopy above, casts long shadows. (*Veitch's Manual*, p. 366.)



Pinus ponderosa, Dougl.
State Nursery, Campbelltown.

Prof. B. E. Fernow says this is a second-class Pine in the United States.

We have had but limited experience of this Pine in Sydney, but sufficient to show that it will thrive here, and it can be recommended for a thorough trial. It does fairly well at Campbelltown.

(25.) *P. pyrenaica*, Lapeyrouse. The "Pyrenean Pine."

The geographical range of *Pinus pyrenaica* may be stated in general terms to extend through the Mediterranean region, from the Pyrenees to the Levant and Asia Minor, whence it spreads eastwards through northern Persia into Afghanistan as far as Herat.* It occurs on many of the mountain ranges throughout this region at altitudes of 2,000 to 6,000 feet. (*Veitch's Manual*, p. 368.)

This should be a useful Pine for New South Wales, not only for the Coast districts, but for considerable elevations on the Coast range.

In Asia Minor, where it forms pure forests, it is much esteemed, not only as a timber tree, but also as a yielder of turpentine.

(26.) *P. radiata*, Don. (Syn. *P. insignis*, Douglas.) The "Monterey Pine," of California. Sargent, tt. 573-4.

A stately tree, of 80-100 feet.

Pinus radiata inhabits a strip of coast-land in South California, extending for about 150 miles from Pescadero to San Simeon Bay, spreading inland only a few miles. It also grows in a peculiar form on Santa Rosa and Santa Cruz, of the Santa Barbara group of islets off the coast of South California, and in Guadalupe, off the coast of Lower California. The wood is light, soft, and brittle, and is used only for fuel.† (*Veitch's Manual*, p. 370.)

Pinus radiata is much cultivated in Australia and New Zealand, where its growth is still more rapid than in Great Britain. In South California it is planted for fixing the sand dunes (*op. cit.*).

This is extensively known in New South Wales by its botanical name of *P. insignis*, but it must give way to that of *P. radiata*, which is two years older. It will not be easy to supplant the name *P. insignis* in favour of the rightful one. It is undoubtedly a most useful Pine, being hardy in many climates and soils, and a rapid grower. It is, hence, often grown for shelter and ornament. A drawback is its liability to sudden death.

It has been attacked, in recent years, by the same Coccid which has destroyed *P. halepensis*, but *P. radiata* has a stronger constitution than *P. halepensis* in the coast districts, and hence has not suffered much.

L 8, 15 b (Sydney Botanic Gardens).

(27.) *P. resinosa*, Solander. "Red Pine." "Canadian Pine."

A tall tree, native of the North American continent between the 41st and 48th parallels. It is a useful timber tree, exuding much resin. In the neighbourhood of the North American lakes it thrives best in a dry, sandy soil. It can only be expected to do best in cold localities.

This is one of the best Pines of the United States according to Prof. B. E. Fernow, but he states that seed is difficult to obtain. [*See Forest Planting Leaflet, United States Department Agriculture Forest Service, Circular 60.*]

We had it in the Sydney Botanic Gardens, but circumstances required its removal. It did moderately well, and it should be further experimented with. It was not a handsome tree with us, but our experience of it is limited.

* Boissier, *Flora orientalis*, v. 696.

† Sargent, *Silva of North America*, xi, 104.



Pinus radiata, Don. (commonly known in N.S.W. as *P. insignis*).
State Nursery, Campbelltown.

(28.) *P. rigida*, Mill. "Pitch Pine."

This is one of the second-class Pines of the United States according to Prof. B. E. Fernow.

It is not in the Sydney Botanic Gardens. It should be well tested in the colder districts.

(29.) *P. Sabiniana*, Douglas. "Digger or Bull Pine" of the United States; "Nut Pine" (England). Sargent, tt. 569-70.

A medium-sized tree, inhabiting the foot-hills of California, both of the coast range and of the Sierra Nevada, almost throughout the entire length of the State from north to south, ascending in places on the latter to 4,000 feet above the level of the sea, but usually much lower. It is so unlike any other Pine in habit and aspect, that even amidst the luxuriant coniferous vegetation of California, it forms a distinct feature of the landscape, appearing in the distance more like an Olive tree or a Willow than a Pine. Its loose and widely-branched habit, and its thin, grey, pendulous foliage tufted at the ends of its crooked, straggling branches, render the tree so pervious to light that it affords no shade, but, at the same time, clothes it with pale colouring so distinct that in the distance this Pine can be easily recognised amidst the darker surroundings. (*Veitch's Manual*, p. 376.)

It yields a poor timber, but its large seeds are much esteemed as an article of food by the Indians.

We have many localities in which this remarkable species may be expected to flourish.

We had it in the Sydney Botanic Gardens for a number of years, and was rather a thin-foliaged plant with us. At the same time it should be further experimented with.

(30.) *P. sinensis*, Lamb.

Has never done well in the Sydney Botanic Gardens. It evidently requires a cooler climate and better soil than is available here.

L 17 a (Sydney Botanic Gardens).

(31.) *P. strobus*, L. "White Pine" of the United States.

See a valuable paper by Prof. B. E. Fernow in the "Year-book of Agriculture" (U.S.A.) for 1897, p. 645, where this tree is recommended as being one of the very best timber Pines in the United States.

See also Forest Planting Leaflet, U.S. Dept. Agric., Forest Service, Circular 67.

Not at present in the Sydney Botanic Gardens. Not a handsome species for the Sydney district, but should be well tried in the coldest localities.

(32.) *P. sylvestris*, L.

The name "Scots Pine" has attached itself to this Pine.

Figured and described in Bentley and Trimen's *Medicinal Plants*.

The Scots Pine has a greater geographical distribution than any other Pine, or even of any other species included in the Abietinæ. With the exception of the southern portion of the Balkan peninsula, it is spread over the whole of Europe, including the British Islands, and in Asia it occurs throughout nearly the whole of that part of the continent comprised within the Russian dominions. (*Veitch's Manual*, p. 380.)

See also Forest Planting Leaflet, U.S. Dept. Agric., Forest Service, Circular 68.

It is a very valuable Pine for shelter, and also for the multifarious uses to which its timber is put.

It should flourish in the colder parts of New South Wales; the ordinary Scots Pine from northern Europe does not flourish in the coast districts.

(33.) *P. Teda*, L. "Loblolly Pine." "Old Field Pine."

Figured and described in Bentley and Trimen's *Medicinal Plants*.

Pinus Teda is one of the most widely distributed of the Pines inhabiting the Atlantic States of North America. It spreads from Delaware southwards to Florida, and through the Gulf States to Texas. Except in the northern portion of its range where it prefers the low lands adjacent to the Atlantic coast, it takes the place of the southern Pitch Pine, *P. palustris*, inland spreading westwards through South Carolina and Georgia to the Mississippi River. West of the great river, the area covered by it is less extensive, but in western Louisiana and eastern Texas it forms considerable forests, and in Arkansas and the Indian Territory it is the most important timber tree of the country. (*Vitch's Manual*, p. 382).

This is one of the species growing in a warm climate, and it should do well in our coastal districts. In the south-eastern United States it is a rapid grower, but it does not seem to yield a valuable timber, and Professor B. E. Ferrow says it is one of the most valuable Pines of that country.

Mr. Robert Garrett grows it well at Chatsworth Island.

L 17 (Sydney Botanic Gardens).

(34.) *P. tenuifolia*, Benth.

Guatemala. A handsome long-leaved Pine, with fine needles, as its name denotes. It is certainly a valuable addition to the plants of the Sydney district. Unfortunately the top was blown off the specimen in the Sydney Botanic Gardens, but it is so full of promise that it is hoped that it may be more widely grown.

L 7 (Sydney Botanic Gardens).

(35.) *P. tuberculata*, Gordon. "Knob-cone Pine." Sargent, tt. 575-6.

A medium-sized tree.

Pinus tuberculata inhabits the dry southern and western slopes, fully exposed to the sun, of the mountain ranges, which under various names, extend from south-west Oregon, its northern limit to the San Bernardino mountains in South California. In some places it forms pure forests of considerable extent; in others it is more scattered and mixed with other trees; its vertical range is from 1,000 to 5,000 feet above sea-level. The wood is soft, brittle, and cross-grained, and but little used. . . .

Pinus tuberculata is singular among pines in bearing cones when only a few feet high, and which remain on the tree for thirty to forty years, often becoming embedded in the bark, and not opening till the tree dies from local causes, or is destroyed by a forest fire. *P. tuberculata* also has the peculiarity of producing its cones on the main trunk as well as on the branches, giving it a singular appearance, as they are arranged around the stem in almost a circle, usually five though often seven cones composing the circle. (*Vitch's Manual*, page 387.)

This tree will flourish in many parts of New South Wales, and is an interesting species, if it possesses no other merits.

We have had it in the Sydney Botanic Gardens, where it did not thrive, but steps are being taken to obtain further specimens.

Sub-tribe 2.—*Lariceæ*.15. *Larix*, Salisbury. “*The Larch*.”

This is a genus of alpine or sub-alpine trees confined to the northern hemisphere. Larches do not do well in New South Wales, merely existing in a few places. At the same time they cannot be said to have been thoroughly tested, say in such places as Southern Monaro.

16. *Pseudolarix*, Gordon.

Laricopsis of *Veitch's Manual*. It is proposed to supersede *Pseudolarix* for purely literary reasons. “Nature produces nothing false,” certainly not in the Greek sense of *pseudos*. Admitted that the name is not a model one, but if botanical nomenclature were to be disturbed on such grounds it would be much more unstable than it is.

(1). *P. Kaempferi*, Gordon. “Chinese or Golden Larch.”

A tall tree, native of China, inflorescence umbellate. Deciduous.

It just exists in the Sydney Botanic Gardens (M 18). It should be well tried in the coldest districts, for it is a beautiful tree.

17. *Cedrus*, Loudon.

A genus of stately trees known as Cedar in Britain.

There are three easily distinguishable forms, conventionally recognised as species but scarcely so in a strictly scientific sense, respectively known as the Cedar of Lebanon, the Deodar or Indian Cedar, and the African or Mount Atlas Cedar.

The typical form which inhabits the slopes of Mount Lebanon and the Cilician Taurus, has been known as *The Cedar* from remote antiquity; the existence of a second Cedar forming extensive forests in the north-west Himalaya was not known to science till the commencement of the nineteenth century; whilst the presence of a third on the Atlas Mountains of Algeria was not suspected till the discovery after the occupation of the country by the French in 1831.—(*Veitch's Manual*, p. 406.)

The geographical distribution of the Cedars is remarkable; they are confined to three separate regions in the great mountain systems that cross the eastern continent between the 28th and 38th parallels of north latitude with but little interruption from the Atlantic Ocean to the China Sea (*op. cit.*).

(1.) *C. atlantica*, Manetti. “Mount Atlas Cedar.”

North Africa. A stately tree attaining a height of 100 feet. For park and landscape considered the best of the three in Great Britain. It has been grown in the Sydney Botanic Gardens for years (*e.g.* M 19), but in our climate it is too close in appearance to the Deodar to be separately planted. In colder districts it would flourish better and display its characteristics.

(2.) *C. Deodara*, Loudon. The “Deodar” or “Indian Cedar.”

A noble tree, native of the mountains of Afghanistan, Baluchistan, and north-west Himalaya. This is the *Cedrus* most generally useful in New South Wales as an avenue or specimen tree.

For an excellent account of it see “The Deodar: a Sylvicultural Sketch” (*Indian Forester*, xxv, 4).

We have many specimens in the Sydney Botanic Gardens (M 19; L 32 b, 35, 15 b, 29 c).

(3.) *C. Libani*, Loud. The “Cedar of Lebanon.”

Native of the Syrian mountains, Cilicia, and Cyprus

A majestic tree of medium size.



Cedrus Deodara, Loudon.
Botanic Gardens, Sydney.

This is the celebrated tree with sacred historic associations. It is hardy in Britain, where there are trees over 2 $\frac{1}{4}$ centuries old.

C. Libani is even more difficult to grow in Sydney than *C. atlantica*. It can only be recommended for the coldest districts.

Sub-tribe 3.—*Sapineæ*.

18. *Picea*, Link. The "Spruce Firs."

This is a genus of evergreen trees of conical or pyramidal outline. It is a fairly natural one, and includes about 17 species, though some may be varieties of better-known forms. Most of them find New South Wales too warm.

The most important botanical characters by which *Picea* is distinguished from *Abies* are:—The leaves are stomatiferous on the upper surface; the dehiscence of the anthers is longitudinal (not transverse); the scales of the cone are always longer than the bract, and persist after the dispersion of the seeds. Very obvious differences are also observable in the pendulous (not erect) cones with differently shaped scales; in the four-angled spines-tipped leaves of the greater number, and in the general habit of most of the species.—(*Veitch's Manual*, p. 423.)

(1.) *P. orientalis*, Carrière. "Eastern or Oriental Spruce."

A medium sized or tall tree, found on the south-eastern shores of the Black Sea, thence to the Caucasus. It is a beautiful species, but not much is known concerning it. It will, doubtless, flourish in many parts of New South Wales.

Our Sydney experience is that it is very slow in growth here, and it should be tried in colder localities.

M 19 (Sydney Botanic Gardens).

(2.) *P. polita*, Carrière. "Prickly Fir."

A tall or medium sized species from Japan, with stout, pungent leaves. It is rather tender in England, and should be well tried in New South Wales.

(3.) *P. Smithiana*, Boiss. (*P. Morinda*, Link.) "Himalayan or Indian Spruce."

A large tree in its native mountains, occurring throughout "the temperate Himalaya from Bhotan to Afghanistan, with a vertical range of from 6,000 to 11,000 feet elevation, and occasionally higher."—(*Veitch's Manual*, p. 455.)

A beautiful species, most suitable of all the *Piceas*, so far as we know, for Sydney conditions, but even it finds our dry spells very trying.

M 19; L 6, 7 c (Sydney Botanic Gardens).

19. *Tsuga*. The "Hemlock Firs."

These are readily distinguished from all other Abietinæ by their habit and foliage, especially by their slender, often drooping, terminal shoots clothed with leaves having a special anatomical structure.

They are tall evergreen trees.

(1.) *T. Albertiana*, Kent. "Western Hemlock" of the United States and Canada. Sargent, t. 605.

A stately, tall tree, the largest of the genus. North California is its southern limit, so that seeds would require to be collected from as warm a locality as possible in order to ensure success in New South Wales.

(2.) *T. Brunoniana*, Carrière. "Himalayan Hemlock Spruce."

A beautiful tree of medium size, for the most part tender in England. It should therefore be quite hardy in sheltered situations in our coast range.

(3.) *T. Caroliniana*, Engelmann. "Carolina Hemlock Spruce." Sargent, t. 604.

This species, originally found in Carolina, also occurs in southern Virginia and northern Georgia. It is a recent introduction into Great Britain as is stated "has thus far proved hardy in the neighbourhood of London." It will probably be found useful in many parts of eastern New South Wales.

(4.) *T. Sieboldii*, Carrière. "Japanese Hemlock Fir."

A medium-sized tree much cultivated in Japan.

T. Sieboldii takes the place of *T. diversifolia* south of Nikko, ascending in places to a considerable elevation, nowhere forming a continuous forest, but scattered in groves among deciduous trees or mixed with *Pinus densiflora*.—(*Veitch's Manual*, p. 473.)

It is, therefore, more likely to succeed in New South Wales than *T. diversifolia*, the other Japanese species, which forms a great forest, covering the Nikko Mountains at an elevation of more than 5,000 feet.

20. *Pseudotsuga*.*

An anomalous genus presenting affinities to *Abies* and *Tsuga* and less closely to *Picea*. Kent, in *Veitch's Manual*, proposes to provisionally place *Keteleeria* with it.

(1.) *P. Douglasii*, Carr. "The Douglas Fir" or "Red Fir." Sargent, t. 607.

The foregoing outline of the distribution of the Douglas Fir brings out prominently the following remarkable facts:—It is the most widely distributed, not only of all American Firs, but of all American trees. It is spread over 32 degrees of latitude, a meridional range greater than that of any other coniferous tree, excepting, perhaps, the common Juniper; it must thence possess a constitution that "enables it to endure the fierce sales and long winters of the north and the nearly perpetual sunshine of the Mexican Cordilleras; to thrive in the rain and fog which sweep almost continuously along the Pacific coast range, and on the arid mountain slopes of the interior, where for months every year rain never falls."† The Douglas Fir is not only one of the most interesting, but it is also one of the most valuable of trees; its size, its capacity of adapting itself to new surroundings and the excellence of its timber, all contribute to make it one of the most important inhabitants of the forests of Western America. It attains its greatest development in the humid lowlands of Western Washington and Oregon, especially around Puget Sound and on the western slopes of the Sierra Nevada, where the precipitation from the Pacific Ocean is greatest; in these regions it often attains a height of 300 feet, with a trunk 9 to 12 feet in diameter.‡—(*Veitch's Manual*, p. 480.)

* Kent, in *Veitch's Manual* (2nd edition, p. 474), proposes to reject the above name (substituting *Abetia*) for the following reason:—An uncouth, barbarous name, half Greek, half Japanese, "utterly bad in construction," and misleading in such meaning as it has, and which I have refused to adopt as a protest against the admission of such names into scientific nomenclature. Also, in compliance with Art. 60, sect. 4, of the Laws of Botanical Nomenclature, adopted at the International Botanical Congress, held at Paris, in 1867, which enacts that—Everyone is bound to reject a name which is formed by a combination of two languages.

† The Vienna Congress does not make this a valid reason, and the supercession of names for such reasons is dangerous.

‡ *Silva of North America*, xii, p. 91.

§ The British public have had for many years past an opportunity of forming an idea of the stupendous dimensions attained by this tree. In the Royal Gardens at Kew is erected a flagstaff brought from Vancouver Island; it consists of a single piece 159 feet in length, 22 inches in diameter at the base, tapering to 8 inches at the summit; it weighs 3 tons and contains 157 cubic feet of timber. The tree from which this flagstaff was made was 250 years old, as indicated by its concentric rings.

Surely a tree like this is worthy of acclimatisation in New South Wales, but care should be taken to select seed from a locality with climatic conditions approximately similar to those obtaining in the locality in which it is proposed to grow it. Some forms (e.g., var. *taxifolia*) are recommended for planting sand dunes near the sea.

20a. *Keteleeria*.

An anomalous genus close to *Pseudotsuga*.

(1.) *K. Fortunei*, Carr. (*Abies jezoensis*, Lindl.)

A large tree resembling the Cedar of Lebanon in habit and aspect. It does fairly well in the Sydney district, and will certainly do better in cooler localities. The best tree in the Botanic Gardens is in that lawn nearest to the Federal Government House Grounds.

M 25 (Sydney Botanic Gardens).

21. *Abies*, Link. The "Silver Firs."

A noble genus of trees, specially ornamental in their young state. They are best suited for the colder districts of this State.

(1.) *A. amabilis*, Forbes. "California Fir."

This might be well tried.

(2.) *A. balsamea*, Miller (*Picea balsamea*, Loudon). "Balm of Gilead Fir." "Balsam Fir." Sargent, t. 610. Also Bentley and Trimen's "Medicinal Plants."

This tree yields Canada Balsam, used for optical purposes.

Native from Newfoundland to Virginia. It is for the most part a swamp tree; "it seems to need a constant supply of water at the roots, as many die in exceptionally dry seasons."

It is chiefly interesting because of its well known oleo-resin, and should therefore be tried in cold regions with moist soil. It just exists in Sydney.

M 18 (Sydney Botanic Gardens).

(3.) *A. bracteata*, Nutt. The "Bristle-coned Fir." Sargent, tt. 615, 616; also *Bot. Mag.* t. 4740.

Remarkable for its long, leaf-like bracts plentiful between the scales.

Abies bracteata is the most remarkable of all the Silver Firs. Its strict but stately habit, its massive deep-green foliage, its singular cones, and especially its extremely restricted habitat, have invested it with an especial interest both for botanists and for horticulturists. Its only known habitat is on the outer western ridge of the Santa Lucia Mountains in South California, where at the present time "it grows only in a few isolated groves scattered along the moist bottoms of cañons, usually at elevations of about 3,000 feet above sea-level."—(*Veitch's Manual*, p. 497.)

It should be hardy in the cooler parts of New South Wales.

(4.) *A. cephalonica*, Loudon. "Mount Enos Fir." "Greek Fir."

A stately, medium-sized tree, growing in Greece at elevations ranging from 2,500 to 5,000 feet.

It is hardy over the greater part of Great Britain, and steps should be taken to thoroughly test it in the colder parts of New South Wales.



Keteleeria Fortunei, Carr.
Botanic Gardens, Sydney.

(5.) *A. cilicica*, Carr. "Cilician Fir."

This inhabits the mountain system of Asia Minor, known under the general name of Taurus. It has a vertical range of 4,000 to 6,500 feet. *Veitch's Manual* states:—

The precise limits of its distribution have not yet been ascertained; these limits may, however, be assumed to be nearly conterminous with those of the Cedar of Lebanon, with which it is associated wherever met with.

That being so, this Silver Fir should flourish in many parts of New South Wales.

(6.) *A. concolor*, Lindl., and Gordon. (*Picea concolor*, Gordon.) "American White Fir." "California Silver Fir."

This Fir has an extensive range west of the Rocky Mountains. It is common on most of the mountain ranges of California, between 3,500 and 8,000 feet, and therefore it may be expected to succeed in our coldest mountain regions. It is a specially handsome species.

(7.) *A. firma*, Sieb and Zucc. "Japanese Silver Fir."

The largest and handsomest of the Japanese species. It is found in the warmest parts of Japan and Corea. It does only fairly well in the Botanic Gardens, Sydney.

In Japan this tree is called "Uro-Siro," signifying that the leaves are white beneath, and also "Sjura-Momi," meaning White or Silver Fir.

(8.) *A. Nordmanniana*, Spach. "Nordmann's Silver Fir." *Bot. Mag.* t. 6992.

A beautiful species from the Trans-Caucasian region, well known in some of our mountain regions, but not as frequently planted as its great merits demand.

It does fairly well in the Sydney Botanic Gardens. On Mount Wilson, New South Wales, for example, it is one of the loveliest trees imaginable

M 19 (Sydney Botanic Gardens).

(9.) *A. religiosa*, Schlecht. "Sacred Fir," because branches are used for decoration of churches. *Bot. Mag.* t. 6753.

Native of Mexico, and often at a considerable elevation. It is the most southern species of the genus, is tender in England, and would probably succeed in many parts of New South Wales.