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NEW ZEALAND.

STATE FORESTS DEPARTMENT

(PROGRESS REPORT OF THE), BY T. KIRK, F.L.S., CHIEF CONSERVATOR OF STATE FORESTS.

Presented to both Houses of the General Assembly by Command of His Excellency.

The CHIEF CONSERVATOR of STATE FORESTS to the Hon. J. BALLANCE.

General Crown Lands Office,
Forest and Agricultural Branch, Wellington, 30th June, 1886.

SIR,—

I have the honour to submit a progress report of the Forest Department, together with a statement of operations proposed for the current year; also appendices containing a descriptive list of forest-trees available for planting in New Zealand, and a schedule of the State forest reserves.

I have, &c.,
T. KIRK,
Chief Conservator of State Forests.

The Hon. J. Ballance.

PROGRESS REPORT by the CHIEF CONSERVATOR, T. KIRK, F.L.S.

ON my appointment as Chief Conservator in December last, I resumed the preliminary examination of native forests on which I had been engaged in the early part of the year, and completed the work about the close of April. It was necessary to complete this before the organization of the department could be commenced, so that it will only be necessary to offer a progress report at this time, stating the steps that have been taken in the way of organization, and the chief operations to be undertaken during the present season.

The results of my inquiries into the present state of native forests, and the condition of the timber trade in each district, have been embodied in two reports which have been laid before the General Assembly by command of His Excellency.

A report on bark and secondary forest products has been prepared and submitted in order to draw attention to the numerous openings that exist for the profitable employment of labour in the utilization of waste forest products.

A popular descriptive work on the timber-trees of the colony is in course of preparation, under the title of "The Forest Flora of New Zealand." A work of this kind is absolutely necessary in order to secure uniformity of nomenclature, and, to facilitate this object, it is proposed to give illustrations of the foliage, flowers, and fruit of each kind, accompanied by a full description in plain language, with a detailed account of the chief uses to which each kind can be applied, its durability, rate of growth, and general adaptability to the purposes of the cultivator. Particulars will also be given of the methods of felling, transport, and conversion of the more important kinds.

As the work will probably find a circulation in Europe and the United States of North America, the botanical portion will be made as complete as possible, and brought down to the date of publication.

Regulations for felling timber in State forests have been prepared, and are now under the consideration of the Law Officers of the Crown. They have been drawn in a sufficiently elastic manner to be applicable to the entire colony, while every precaution has been taken to avoid unnecessary interference with established customs on the one hand, or to make a needless increase in the royalties on the other.

The absolute need of a thorough reform in existing regulations on this important subject will be obvious on a perusal of the following statement of regulations in force in different parts of the South Island only:—

In Southland, timber on Crown lands may be cut on payment of 3d. per 100 superficial feet on converted timber.

In Otago, on payment of £1 1s. per acre, in three annual instalments.

In Canterbury, on purchase of the land at £2 per acre.

In Nelson, on payment of an annual rent of 4s. per acre.

In Marlborough, on payment of a royalty of 6d. per 100 superficial feet, measured in the log.

In Westland, on payment of a fee of £5 per annum for, say, 100 acres or upwards; practically, an unlimited quantity of logs might be cut on payment of this amount.

The following important points have been kept in view in preparing the new regulations:—

1. To afford a sufficient area to insure a certain degree of permanence to the operations of the licensee, and yield a fair return for the capital sunk in buildings, &c.

2. To give the licensee a direct interest in preventing wasteful conversion, and diminishing the risk of fire.

3. To prevent unnecessary injury to young growth, and insure the natural renewal of the forest.

4. To facilitate efficient supervision.

The Chairmen of County Councils have been requested to act as local Conservators, and in most instances have willingly consented. The great advantages afforded by this ready co-operation, combined with the local knowledge possessed by these gentlemen, cannot fail to prove of great assistance in carrying out the provisions of the State Forests Act.

Advantage has been taken of the knowledge and experience of the Chief Surveyors of the provincial districts who have been appointed Inspectors of State Forests, and as Commissioners of Crown Lands will be intrusted with the duty of issuing licenses for cutting timber. They will also exercise a general supervision over the Forest Rangers. The field Surveyors will be instructed to report any cases of trespass or injury to State forests that may come under their observation.

The working staff of the department will consist of the following officers: The Chief Conservator, who will be intrusted with the control of the State forests and the management of all details, the employment of the officers and labourers in the forests, plantations, and reserves, and generally to conduct the practical work of the department, subject to the approval of the Honourable the Commissioner of State Forests; Assistant Conservators, who will be two in number, and who will work directly under the instruction of the Chief Conservator; Foresters, who will act as valuators, and exercise a general supervision over the Rangers in their respective districts; Nurserymen, who will have charge of the permanent nurseries, and the formation and supervision of new plantations; Forest Rangers, whose duties will be to protect the forests from depredation and fire, and who must be continually in the forests.

During the present year only three Nurserymen will be appointed, as it is not intended to form large establishments for the growth of young plants. In some localities it is hoped that local nurserymen may be willing to supply one- and two-year-old plants of certain kinds, at sufficiently low rates to warrant the department leaving the supply of plants to outsiders; but this can only be done where there are facilities for transport. In all cases, planting operations must be conducted under the supervision of a Nurseryman, labourers being engaged from time to time as their services are required.

Rangers or Forest Guards will eventually form a considerable body. Their pay will vary from £100 to £150, according to the importance of their work. Where a Ranger is placed in charge of a single compact forest or of a small district no travelling allowance will be required, but where the district is large, a fixed allowance will be made for the keep of a horse and expenses; or, if in a district easily accessible by rail, an allowance specially adapted to the requirements of the case will be made. In certain isolated localities it will be necessary to erect cottages for the accommodation of the Ranger or Nurseryman.

With the gradual expansion of revenue, and consequent increase of the working staff, it will be necessary to extend the means of supervision. The cheapest and most effectual way of doing this will be to divide the colony into districts, and appoint a District Forester for any district in which the forests occupy a certain area. This officer will have charge of all measures for conservation and of all planting operations, with the direct supervision of Foresters, Nurserymen, and Rangers within the limits of his district; but this step will not be warranted in less than three years. In the meantime these duties must be discharged by the Assistant Conservators, with the assistance of the Chief Surveyors.

As far as possible, Foresters will be selected from the Rangers who display the greatest aptitude for their work, and are properly qualified, so that fair opportunities of advancement will be offered to deserving men. In like manner it is proposed to select District Foresters from the Foresters and Nurserymen who may show themselves qualified for higher duties.

During the present year it is intended to appoint one Assistant Conservator, four Foresters, three Nurserymen, and eight Rangers, in addition to a Ranger appointed last year, and another transferred from the Crown Lands Department.

The most important work to be taken in hand during the present season is the classification of forest reserves, which will necessitate a detailed examination of each forest preparatory to laying down a plan for its future management. This will occupy all the time that the Chief Conservator and his assistant will be able to devote to it for several years.

The following classification has been adopted:—

Class I.

Climatal or Mountain Reserves, to include all Forests reserved for Shelter, for the Conservation of the Water-supply, or for Climatic Reasons, irrespective of Altitude.

This class comprises most of the reserves already proclaimed; in many cases they occupy the crests of ranges and other situations in which it is absolutely necessary that forests should be maintained on account of their climatic importance. In forests of this kind the timber is frequently of small value, and in many cases its removal would be too costly to prove remunerative at present rates. In certain climatal reserves, however, the present timbers may be replaced by others of greater value, and will prove of great importance in years to come. In forests of this class only a limited area can be felled in any one season, and the trees must be branded by an officer of the department.

Class II.

Forest Reserves and Plantations.

This class will ultimately include the great bulk of our convertible timber, whether kauri, rimu, totara, eucalypts, oaks, or other kinds. Felling will be by periodic selection, or by rotation of area, according to the nature of the forest.

Class III.

Timber Reserves.

This class will include forest blocks reserved until such time as the timber can be profitably converted, and can scarcely be considered as forming a portion of the permanent reserves. When cleared, such blocks will be placed under the control of the Commissioner of Crown Lands for settlement, unless specially proclaimed under Class II. In this way it will be possible to prevent the needless destruction of a large amount of valuable timber without retarding the progress of settlement, at the same time providing for the employment of settlers of limited means.

It is intended to commence the classification of the forests in the Otago and Southland Districts and Stewart Island at an early date. A complete enumeration of all forest reserves gazetted will be given as an appendix to this report.

Planting Operations.

It has been already stated that it is not intended to establish large nurseries in localities where local nurserymen may be prepared to tender for the supply of young plants; but in places difficult of access it will be necessary to form temporary nurseries when planting operations are to be carried on to a large extent, especially where pines are to be planted. In the case of eucalypts, sowing may be adopted when the ground is moderately level; and this is undoubtedly the cheapest method, as under favourable circumstances cleared land may be prepared and sown at from £1 to £1 15s. per acre, not including fencing. As far as possible the land should be ploughed and cleaned in the early autumn, so as to allow it to sweeten by exposure. Under favourable conditions one-year-old eucalypts may be planted on low manuka land at about £1 15s. per acre, the plants to be set out at about seven and a half feet apart over all. Generally speaking it will be advisable to transplant pines and give them a second year in the nursery, but it is not possible to lay down cast-iron rules, and it will be found wise to give the nurseryman in charge a certain amount of discretion in the matter.

Catalogue of Forest-trees.

A brief descriptive list of the chief kinds of trees available for forest-planting in New Zealand is issued as an appendix to this report.

It is proposed to commence the following planting and replacement operations during the present season:—

Hokianga County.

Omahuta and Waikoropupu Forests.

To form a temporary nursery to raise plants of jarrah (*Eucalyptus marginata*) and Californian redwood (*Sequoia sempervirens*), for planting about 500 acres of open land included in the boundaries of the reserves, and replacing a similar area now covered by worthless scrub. The scrub to be thinned or cleared during the summer.

RODNEY AND BAY OF ISLANDS COUNTIES.

It is intended to make a special examination of certain reserves in these counties with the view of arranging for the replacement of a large amount of useless scrub with puriri, the most valuable timber in the colony for railway sleepers, the beds of railway carriages, and other purposes where great strength and durability are required.

WAIKATO COUNTY.

Waerenga Plantation Reserve.

To lay down about 300 acres under golden wattle (*Acacia decurrens*) and black wattle (*Acacia pycnantha*) by sowing. To plant about 300 acres with one-year-old plants of red gum (*Eucalyptus rostrata*) and ironbark (*Eucalyptus leucoxylon*), and establish a temporary nursery to raise plants for planting the remainder of the area next season.

TARANAKI COUNTY.

Mount Egmont Reserve, 72,382 Acres.

It is intended to make a detailed examination of portions of this reserve in order to ascertain the cost of replacing the valueless scrubby growth with convertible timber, and the possibility of extending exotic arboreal vegetation above the altitudinal limits attained by native trees.

WHANGAREI COUNTY.

Puhipuhi Forest, 19,682 Acres.

It is proposed to thin out portions of the scrub on the margin of the kauri and make preparations for filling up the gaps with redwood or jarrah; also for planting the open spaces and surrounding the whole with a protective belt of fire-resisting trees.

MANIOTOTO COUNTY.

Plantation Reserves: Gimmerburn, 1,263 Acres; Upper Taieri, 2,051 Acres.

To fence and form nurseries for young plants; to plant a portion of the above with Douglass fir (*Abies Douglassii*), cider gum (*Eucalyptus Gunnii*), and English oak (*Quercus pedunculata*). The entire area to be planted in about three years.

The estimated forest revenue for the year ending the 31st March, 1887, is £3,500, derived exclusively from royalty on the sale of timber. The total expenditure for conservation and the formation of new plantations during the same period, including the salaries of the Conservator and his assistants, is estimated at £7,000. This, of course, does not include the claims for compensation under the Forest-trees Planting Encouragement Act, the equipment and maintenance of the School of Forestry and Agriculture, nor the cost of the agricultural section.

I am fully convinced that the Forestry Department may not only be made self-supporting within five years, but that it will ultimately yield a material addition to the general revenue of the colony; while, concurrently with this benefit, a vast amount of raw material will be preserved for utilization, and new openings created for the profitable employment of labour. But this result can only be effected by the forest and plantation reserves being retained under the control of the department.

FRUIT SECTION.

Under special instructions from the Commissioner of State Forests, inquiries concerning the diseases and parasites of fruit-trees commenced last year have been continued by the Chief Conservator as fully as his primary duties permitted, and a large amount of additional information has been obtained, which will be published in a separate report.

The report on this subject, presented at the close of last session, has been so largely in demand that it is out of print, although the number of copies printed was exceptionally large. This affords satisfactory evidence of the importance of the subject and the general interest taken in it. On the request of the Queensland Government, permission was granted to reprint the report for general circulation in that colony.

Progress has been made in the preparation of drawings to illustrate a descriptive work on the chief fungoid and insect enemies of the fruitgrower, which it is intended to publish as soon as more complete information has been obtained on certain subjects. The work will include an account of the most important remedies, and the best methods of applying them. It has been found practically impossible for the Chief Conservator to keep pace with the large amount of new work continually cropping up in connection with fruit cultivation without occasionally neglecting his primary duties. This is especially the case during the early spring months, when forest and plantation work requires his undivided attention; but it is at this period that close and continued observation is most necessary to ascertain the life-history of the most destructive insect pests. With a view of meeting the legitimate claims of fruitgrowers, and assisting the development of an important branch of cultivation, it is proposed to engage the services of a competent biologist, whose time should be entirely devoted

to the investigation of the parasitic diseases of fruit-trees, forest-trees, and ordinary farm crops, under the direction of the Chief Conservator. It is imperative that this gentleman should be a good microscopist and a thoroughly-trained observer, possessing at least a good general knowledge of parasitic fungi and insects, as well as of the laws of vegetable and animal life. Such a position might be looked upon as affording encouragement to students of the New Zealand University to direct their attention to the practical application of botany and zoology, to the arts of the cultivator; and, other things being equal, amongst competing applicants, preference should be given to a University student who has taken honours in botany and zoology The salary for the first year need not be high, but a special agreement should be made for its being increased to a fair amount within three years.

Valuable assistance might be rendered to the fruit industry in another direction, and at a small expense. The various fruitgrowers' and gardeners' societies comprise many individuals of great ability in their profession, and possessing the power of stating the results of their practice and experience in a readable manner. I feel convinced it would be rendering good service to the colony if these societies were invited to forward a selection of papers read at their meetings, with abstracts of the discussions which ensue, to be printed by the Government in a plain form, when copies should be sold at the actual cost of printing: it seems undesirable to distribute them free of cost. The papers should be printed as read, but the department should retain the right of selection, which would ultimately be found necessary to prevent the annual volume becoming inconveniently large. In this way a vast amount of information now confined to a few individuals would be made readily available for fruitgrowers at large, and the beneficial influence arising from its diffusion would be felt in every part of the colony.

There is no doubt that the next three years will witness the development of a large export of fruit from the Australian Colonies to the chief ports of Great Britain, the Continent of Europe, and the United States, as fruit can be shipped here to reach those markets at a time when the home products are completely exhausted, while increased facilities are being afforded for shipment, and every effort made to shorten the time required for transport. It is stated that Great Britain alone imports American apples to the value of £2,000,000 per annum. It is, therefore, desirable that all reasonable assistance should be afforded to fruitgrowers in order that this colony may be prepared to claim her rightful share of this remunerative industry.

School of Forestry, Pomology, and Agriculture.

A report on the adaptability of the Kioreroa Block, Whangarei, to this purpose has been prepared and submitted in a separate form, together with a plan for the organization of the school on a self-supporting basis.

APPENDIX.

A DESCRIPTIVE CATALOGUE OF TREES AVAILABLE FOR FOREST-CULTIVATION IN NEW ZEALAND, BY T. KIRK, F.L.S., CHIEF CONSERVATOR OF STATE FORESTS.

The following list has been prepared under the instructions of the Hon. the Commissioner of State Forests, with a view of assisting settlers who may contemplate the formation of plantations. The systematic and common names of each species are given (except in those cases where the tree has not received a common name), its native country, usual dimensions, properties of timber, and uses to which it is generally applied, all of which are stated as concisely as possible. The list makes no pretensions to be considered exhaustive, and is practically restricted to trees capable of producing timber of economic value, although a few species have been admitted on account of their value as hedge-plants, or affording bark for tanning purposes, or for their capacity of growing upon drift-sand, or for special power to resist fire, &c.

At some future opportunity it is intended to enlarge the catalogue so as to include a copious selection of species adapted to the reclamation of coastal sand-wastes, and other special purposes connected with arboriculture.

LIRIODENDRON (*Linne*).

Liriodendron tulipifera (*Linne*). "Tulip-tree," "Yellow Wood." United States of North America.—A noble deciduous tree, 80ft. to 100ft. high, remarkable for its saddle-shaped leaves and handsome flowers. Wood yellowish or red, often streaked and waved; largely used for house-building, especially for inside work, doors, framing, furniture, shingles, canoes, railway-carriages, bridges, &c. A preparation of the bark of the roots is used for the cure of intermittent fevers, and a vermifuge for cattle is prepared from the bark of the trunk.

RHAMNUS (*Linne*). The Buckthorn.

Rhamnus Frangula (*Linne*). "The Berry-bearing Alder." Europe, Northern Africa, Temperate Asia.—Valuable for undergrowth in damp woods. Affords the best charcoal for the manufacture of gunpowder, and is largely imported into England from Belgium for that purpose.

R. catharticus (*C. Bauhin*). "Buckthorn." Europe, Temperate Africa, and Asia.—Employed as a hedge-plant in the midland and southern counties of England, and would be of still greater value

for this purpose in New Zealand, as it is not liable to the attacks of the slug-leech, which is destroying the hawthorn. It may also be grown as underwood, but is of less value than *R. Frangula* for this purpose. The berries are a drastic aperient, and form the basis of the "sap-green" of artists.

CEDRELA.

Cedrela australis (*F. Mueller*). "Australian Red Cedar." Eastern Australia, as far south as 36°.—"Attains the height of 200ft. and a stem-girth of 18ft. towards the base. Messrs. Danger and Name measured a tree on the Macleay River 48ft. in stem-circumference at 10ft. from the ground; it yielded 80,000ft. of sound timber. Market-value in Brisbane, 15s. to 17s. per 100 superficial feet."—*Baron von Mueller in "Select Extra-tropical Plants for Industrial Culture."* The timber afforded by this tree is highly ornamental, smooth, even in the grain, and takes a fine polish. It is largely imported into New Zealand for office-fittings, furniture, and boat-building. Suitable for planting in districts north of the Waitemata, and may be propagated by seeds or by cuttings of the root.

ACER (*Linne*). The Maple.

Acer pseudo-platanus (*Linne*). "The Sycamore." Europe, Asia Minor.—Height, 80ft. to 100ft. A well known shade-tree. Flourishes in all parts of New Zealand. Wood white, firm, even, and easily worked, but not durable when exposed; valued for dairy-ware, musical instruments, and many other special purposes.

A. macrophyllum (*Pursh*). "Large-leaved Maple." Western Coast of North America.—Height, 80ft. A noble species, flourishing in cool soils. Wood of a satiny lustre, often with fine veins; highly valued for furniture. A species of rapid growth.

A. platanoides (*Linne*). "Norway Maple." Norway to Switzerland.—Height, 60ft. to 80ft. Wood of equal value to A. macrophyllum, but less satiny. May be planted on blown sand.

A. saccharinum (*Wangenheim*). "Sugar Maple." Canada, Nova Scotia, Eastern United States.—Height, 60ft. to 100ft. Wood hard, firm, and compact; sometimes used as a substitute for oak for inside work; employed by wheelwrights, turners, founders, builders, &c., and especially by cabinet-makers for ornamental furniture and for decorative purposes. The wood is often curled, clouded, waved, or spotted, when it forms the well-known bird's-eye maple, and the entire log is converted into veneers, which are turned off parallel to the concentric rings. In Canada and the United States sugar is extracted from the sap in newly-settled districts where the sugar-maple is plentiful; but in this colony the value of labour would render it cheaper to purchase imported cane-sugar.

A. rubrum (*Linne*). "Red-flowered Maple." Canada and Eastern United States.—A lofty species, preferring moist situations, and forming the maple-swamps of Florida; but often found on dry ranges. Timber of similar value to that of the sycamore, but when curled or mottled valued for ornamental furniture.

CYTISUS (*Linne*).

Cytisus scoparius (*Linne*). "Broom." Europe, Temperate Asia.—A dwarf bush, valuable as undergrowth in open woods, and especially on their margins, as it tends to arrest the progress of fires. May be sown or planted on blown sand.

GENISTA (*Linne*).

Genista candicans (*Linne*). Southern Europe.—A dwarf bush, suitable for the margins of fire-belts, and for planting on blown sand; but will grow in almost any soil.

ROBINIA (*Linne*). Locust Tree.

Robinia pseudacacia (*Linne*). "False Acacia," "Cobbett's Locust Tree." Upper Canada to Arkansas.—Height, 60ft. to 80ft. An elegant tree. Wood hard, heavy, dense, extremely durable, and of great strength; highly valued for trenails, as it becomes harder with age; excellent for fencing, and may be considered second to the puriri for this purpose; makes the best axle-beds; used for various purposes connected with shipbuilding, also for turnery, &c. Will grow in almost any kind of soil, but prefers rich, moist lands. May be planted on blown sand.

CARMICHÆLIA (*R. Brown*).

Carmichælia australis (*Brown*). "New Zealand Broom." North Island, general; rare and local in the South.—A shrub 5ft. to 10ft. high; of great value for planting on the margins of woods and plantations as it arrests the spread of fires.

SOPHORA (*Linne*).

Sophora Japonica (*Linne*). China, Japan.—Height, 50ft. to 60ft. A small, but elegant and showy tree. Wood extremely dense, compact, and durable; valued for ornamental turnery, furniture, &c., and would probably prove available for small marine piles. The flowers and seeds yield a fine yellow dye.

S. tetraptera (*Aiton*). "Kowai." New Zealand, North Cape to Southland.—A variable plant, sometimes reduced to a mere prostrate shrub, but more frequently forming a small tree 30ft. to 40ft. high, with a trunk from 1ft. to 3ft. in diameter. Timber firm, compact, durable, and ornamental; used for wharf- or jetty-piles, spokes, and furniture. This handsome tree is readily amenable to cultivation, and, if pruned during its early stages, would develop good straight stems with but little trouble.

ACACIA (*Willdenow*).

Acacia pycnantha (*Bentham*). "Broad-leaved Wattle," "Golden Wattle." Australia.—A small tree. Affords one of the best barks for tanning, containing 30 per cent. of tannin. The true leaves are produced only during the young state, and are succeeded by broad, flattened, foliaceous appendages, which resemble the leaves of the puka or broadleaf (*Griselinia littoralis*). The wood is used for turnery-work, and is excellent for firewood.

A. melanoxylon (*Robert Brown*). "Blackwood," "Lightwood." Southern Australia.—Wood used for carriage-building, furniture, cooper's work, and many other purposes. Of rather slow growth in this colony.

A. decurrens (*Willdenow*). "Black Wattle." Australia, Tasmania.—"A small or middle-sized tree. Its wood is used for staves, for turners' work, occasionally for axe- and pick-handles, and many other purposes; it supplies an excellent firewood. A chief use of the tree would be also to afford the first shelter in treeless localities for raising forests. Its bark, rich in tannin, and its gum, not dissimilar to gum arabic, render this tree highly important. The English price of the bark ranges from £8 to £11; in Melbourne it averages about £5 to £8 per ton. It varies, so far as experiments made in my laboratory have shown, in its contents of tannin principle from 30 to 40 per cent. in bark completely dried. In the mercantile bark the percentage is somewhat less, according to the state of its dryness, it retaining about 10 per cent. moisture. 1½lb. of black-wattle bark gives 1lb. of leather; whereas 5lb. of English oak-bark are requisite for the same results; but the tannin principle of both is not absolutely identical. Melbourne tanners consider a ton of black-wattle bark sufficient to tan twenty-five to thirty hides; it is best adapted for sole-leather and other so-called heavy goods. The leather is fully as durable as that tanned with oak-bark, and nearly as good in colour. Bark carefully stored for a season improves in tannin-power considerably. From experiments made under the author's direction it appears that no appreciable difference exists in the percentage of tannin in wattle-bark, whether obtained in the dry or in the wet season. The tannin of this acacia yields a gray precipitate with ferric, and a violet colour with ferrous salts; it is completely precipitated with a strong aqueous solution by means of concentrated sulphuric acid. The bark improves by age and desiccation, and yields about 40 per cent. of catechu, rather more than half of which is tannic acid. Bichromate of potash, added in a minute quantity to the boiling solution of mimosa tannin, produces a ruby-red liquid fit for dye-purposes; and this solution gives with the salts of sub-oxide of iron black pigments, and with the salts of the full oxide of iron red-brown dyes. As far back as 1823 a fluid extract of wattle-bark was shipped to London, fetching then the extraordinary price of £50 per ton, one ton of bark yielding 4cwt. of extract, of tar-consistence (Simmonds); thus saving much freight and cartage. Tan-extract is best obtained from the bark by hydraulic pressure and evaporation of the strong liquid thus obtained in wide pans under steam-heat, or, better still, to avoid any decomposition of the tannic acid, by evaporation under a strong current of cold air. For cutch or terra japonica the infusion is carefully evaporated by gentle heat. The estimation of tannic acid in acacia-barks is effected most expeditiously by filtering the aqueous decoction of the bark after cooling, evaporating the solution, and then redissolving the residue in alcohol, and determining the weight of the tannin principle obtained by evaporating the filtered alcoholic solution to perfect dryness. The cultivation of the black wattle is extremely easy, being effected by sowing either broadcast or in rows. Seeds can be obtained in Melbourne at about 5s. per pound, which contains from 30,000 to 50,000 grains. They are known to retain their vitality for several years. For discrimination in mercantile transactions it may be noted that the seeds of the genuine *A. decurrens* are somewhat smaller, comparatively shorter, rounder, and not so flat as those of *A. dealbata;* while the funicular appendage does not extend so far along the seeds, nor is the pod quite so broad. From those of *A. pycnantha* they differ in being shorter, thus more ovate than oblong. Seeds should be soaked in warm water before sowing. Any bare, sterile, unutilized place might most remuneratively be sown with this wattle-acacia. The return could be expected in from five to ten years. Full-grown trees, which supply also the best quality, yield as much as 1cwt. of bark. Mr. J. Dickinson states that he has seen 10cwt. of bark obtained from a single tree of gigantic dimensions at Southport. A quarter of a ton of bark was obtained from one tree at Tambo without stripping all the limbs. The height of this tree was 60ft., and the stem 2ft. in diameter. The rate of growth of the tree is about 1in. in diameter of stem annually. It is content with the poorest and driest soil, although in more fertile ground it shows greater celerity of growth. This acacia is, perhaps, the most important of all tan-yielding trees of the warm temperate zones for its strength in tannic acid, its rapidity of growth, its contentedness with almost any soil, the ease with which it can be reared, and its early yield of tanner's bark, and, indeed, also gum and stave-wood. This tree is to be recommended for poor land, affected with sorrel. It is hardier than *Eucalyptus globulus*, thus enduring the climate of south England, although it hardly extends to sub-alpine elevations."—*From Baron von Mueller's "Select Extra-tropical Plants."*

In New Zealand this species is commonly confused with the grey or silver wattle *(Acacia dealbata)*, which has been generally planted, but from which it may be distinguished by its green foliage and interrupted pod, which requires fully a year to ripen, so that pods and flowers are to be seen on the tree at the same time. Silver wattle and black wattle are alike naturalized in several localities in the North. Bark of the black wattle from Hokianga, analysed in the Colonial Laboratory, yielded 23 per cent. of tannin. A good specimen of the black wattle is to be seen in the grounds of the Hon. W. B. D. Mantell, F.G.S., &c., Wellington.

EUCALYPTUS (*L'Heritier*).

The genus comprises about 135 species, nearly all of which are restricted to Australia, a few only being found in New Guinea, Timor, and the Molucca Islands. They occur from sea-level to nearly 6,000ft., and vary from mere shrubs to magnificent trees 470ft. high. Several species afford

timber of great strength, density, and durability, suitable for the heaviest constructive works, shipbuilding, &c.; others yield timber better adapted to general building-purposes, for wheelwrights work, furniture, &c. The leaves of many species yield a valuable oil, which now forms an important manufacture in Australia. Several species exude a valuable manna, and others afford large quantities of gum-kino. The bark of others is valued for the large amount of tannin which it contains, in some cases amounting to 20 per cent.

For the greater part of the information contained in the following list I am indebted to Baron von Mueller's "Eucalyptographia," or to private notes received from him during a correspondence extending over several years.

One species, *Eucalyptus globulus*, will doubtless become naturalized in the colony. In some situations self-sown seedlings are abundant, and in one or two places have attained the height of 30ft.

Eucalyptus amygdalina (*Labill.*), "White Peppermint Gum," "Giant Gum," &c.—The loftiest tree in the world, attaining the extreme height of 470ft., but usually much smaller. Wood useful for general building-purposes where great strength is not required; of rapid growth, and more hardy than the common "blue-gum:" a valuable tree for inland and subalpine situations. Its leaves afford a large percentage of oil, 1,000lb. weight of the leaves yielding 500oz. of oil, according to Baron von Mueller.

E. eugenioides (*Sieber*), "White Stringy-bark Tree."—A noble species, often attaining a height of over 200ft. in poor land, and affording durable timber for general purposes, although not so highly valued for its fissile properties as other stringy barks.

E. piperita (*Smith*), "Peppermint Gum."—Trunk about 3ft. in diameter, affording a useful timber of considerable value, but inferior to other species in strength and durability.

E. pilularis (*Smith*), "Blackbutt."—Varying in height from 120ft. to 300ft., occasionally with a massive trunk, 10ft. to 15ft. in diameter, affording valuable timber for general purposes.

E. obliqua (*L'Heritier*), "Messmate," "Stringy-bark."—A rapid-growing species, of medium dimensions, affording durable timber for general purposes, easily worked, and remarkable for its fissile properties. A valuable species for poor soils.

E. hæmastoma (*Smith*), "White-gum Tree."—A small tree, chiefly valuable on account of its growing freely on sandy land.

E. microcarys (*F. Mueller*), "Tallow wood."—This species attains the height of 100ft., with a trunk from 3ft. to 6ft. in diameter. Timber easily worked, durable, does not split or twist. Only suitable for the North Island.

E. marginata (*Smith*), "Jarrah."—A noble species, attaining a large size and producing timber of great strength and durability, yet of fine, even grain, so that it is easily worked. It is suitable for all building-purposes—flooring-boards, scantling, weatherboards, or sawn shingles. For shipbuilding it stands next to English oak; it is superior to the teak of India and the greenheart of South America. It stands second to the totara of New Zealand for marine piles and structures exposed to the attacks of teredo, but is of more rapid growth. It is excellent for railway-sleepers, bridges, &c., while it is largely employed by the wheelwright.

Timber, said to be jarrah, was employed in the construction of the bridge across the Manukau Harbour, between Onehunga and Mangere, where it was speedily riddled by teredines. This occurrence is so directly opposed to the bulk of evidence in favour of the true jarrah being able to resist the attacks of boring molluscs and crustacea that it can only be explained by the supposition of the timber of some other eucalypt having been substituted. The amount of evidence in its favour is overwhelming. Sapling poles and old piles are uninjured after exposure to the attacks of teredo for thirty years. It appears to be of slow growth when planted in the vicinity of Melbourne. In Auckland plants raised from seed received by the present writer from Baron von Mueller attained the height of 10ft. the second year.

One of the most valuable trees at our command for planting on open spaces in kauri forests, and other places north of the Auckland Isthmus, but not suitable for the climate of the South Island.

E. paniculata (*Smith*), "Red Ironbark."—Not of the largest dimensions, but affords a durable timber, more easily worked than some of its allies, and suited for general building-purposes, railway-sleepers, &c.

E. leucoxylon (*F. Mueller*), "Ironbark" of Victoria.—A moderate-sized tree, from 100ft. to 120ft. or more in height, producing a timber of great strength and durability, much in demand for railway-sleepers, mine-props, &c. The bark contains 21·94 per cent. of tannin. Suitable for poor soils, and should be extensively planted.

E. polyanthema (*Lebauer*).—This species attains the height of 120ft. and furnishes a durable timber of great strength, valued for railway-sleepers, mining-props, &c. This species will endure a considerable degree of frost.

E. crebra (*F. Mueller*).—A medium-sized tree, with a trunk 3ft. in diameter, affording durable timber, adapted for railway-sleepers, railway-wagons, and similar purposes.

E. siderophloia (*Benth.*), "White Ironbark."—This is a most valuable species, affording a remarkably strong and durable timber. According to Baron von Mueller it is even stronger than hickory. Used for railway-sleepers, constructive works, wheelwrights' work, &c. It should be extensively planted in this colony.

E. diversicolor (*F. Mueller*), "Karri."—A noble species, attaining colossal proportions. Baron von Mueller states that trunks have been measured 300ft. in length to the first branch, and that planks can be obtained fully 12ft. in width. The timber is durable and elastic, and is valued by the shipbuilder, wheelwright, &c.

The great width of planking obtained from this species renders it available for special purposes; it is also used for masts, &c. It is a species of rapid growth under cultivation in Australia, but in all probability would not flourish south of Hokitika, in New Zealand.

E. calophylla (*R. Brown*), "Red-gum" of South-west Australia.—A fine species, attaining 150ft. in height, with a trunk from 5ft. to 10ft. in diameter. Suitable for general building-purposes, framing, &c., but not durable when in contact with the ground. Of special value for wheelwrights' works and agricultural implements.

A valuable tanning extract, kino, is procured by tapping the tree, and sells at from £20 to £25 per ton in London. When dry it forms "gum-kino," and is employed medicinally and as a dressing for wounds. It would not be advisable to plant this species south of the Auckland Isthmus.

E. corynocalyx (*F. Mueller*), "Sugar Gum."—Attains the height of 120ft.; trunk 4ft. to 5ft. diameter, but not of rapid growth. Timber durable for railway-sleepers, fencing-posts, &c.

E. viminalis (*Labill.*), "Manna Gum."—A useful species, attaining the height of 300ft., and affording good timber for general building-purposes where great strength is not required.

E. rostrata (*Schlechtendal*), "Red-gum Tree."—One of the most valuable species of the genus, although not affording timber of the largest dimensions.

The timber is of great strength and durability, and is suitable for bridge and constructive works, heavy ship-timbers, fresh-water and marine piles, railway-sleepers, fencing-posts, and a variety of purposes. The jarrah is the only eucalypt that surpasses this species in durability, although several species afford timbers of somewhat greater strength. It flourishes in most parts of the colony, and should be largely planted in lowland districts where a moderately good soil can be obtained.

E. Gunnii (*Hooker f.*), "Swamp Gum."—At low levels—say, from 1,000ft. to 2,000ft.—this forms a tree from 100ft. to 200ft. in height; but at great altitudes—say, 5,000ft.—it becomes reduced to a shrub and forms miniature forests. Wood useful for ordinary carpentry and various purposes. This species will doubtless prove of value in alpine districts. In Tasmania it ascends to 5,500ft.

E. resinifera (*Smith*), "Red Mahogany Gum."—A medium-sized tree, affording strong and durable timber. Not suitable for planting in the South Island.

E. botryoides (*Smith*), "Bastard Mahogany."—Timber hard and durable; valued for wheelwrights' work, fencing-posts, &c. This species will probably prove valuable for planting on coastal sands in the North Island.

E. goniocalyx (*F. Mueller*), "White-gum Tree," "Grey Box," &c.—A fine species, ranging from 150ft. to 300ft. in height, with a trunk from 4ft. to 8ft. in diameter, producing a hard, tough, durable timber, not easily split, but suited for building and general purposes, specially valued by wheelwrights for spokes.

E. robusta (*Smith*), "Swamp Mahogany."—A useful species, affording logs 50ft. in length, 30in. by 30in. and upwards, forming serviceable timber where great strength is not required; specially valued on account of its durability in damp places.

Useful for planting in swampy land, especially near the sea. It may be employed to replace kahikatea forest in the North, but is unsuited for the South Island.

E. globulus (*Labill.*), "Blue Gum."—A well known species, attaining upwards of 300ft. in height, producing timber of great strength and durability, used for general building-purposes, shipbuilding, railway-sleepers, telegraph-poles, wheelwrights' work, fencing-posts, and other purposes.

A valuable tree, which flourishes, with but few exceptions, in lowland situations as far south as Port William, on Stewart Island. It is, however, killed off in situations near the sea in the vicinity of Invercargill, and the leaders are frequently killed at very low elevations in the South Island. It grows with great vigour on the pumiceous soil of the Taupo District, although not easily established at first.

E. gomphocephala (*De Candolle*), "Tooart."—A species affording valuable timber for shipbuilding, piles for bridges, and all other purposes where great hardness, strength, and durability are required. It is not of the largest dimensions, but logs can be obtained from 45ft. to 50ft. long, squaring 28in. by 28in. The timber is difficult to split, and in all respects is stronger than English oak. Specially suitable for limestone districts.

METROSIDEROS (*R. Brown*).

Metrosideros tomentosa (*A. Cunningham*). "The Pohutukawa." New Zealand: Sea-cliffs from the North Cape to Poverty Bay and White Cliffs; also by Tarawera and Taupo Lakes.—A magnificent tree when in flower, attaining the height of 70ft. Trunk usually short, from 2ft. to 3ft. in diameter. Timber firm, compact, dense, and heavy, of exceptional strength and durability. The huge tortuous arms are greatly valued for ship-timbers. Should be planted on all sea-cliffs in the Auckland District. Even in Wellington, specimens planted twenty years are over 30ft. in height.

EUGENIA (*Linne*).

Eugenia Maire (*A. Cunningham*). "Maire-tawhake." New Zealand, North Cape to Marlborough, in swamps.—A small tree, 40ft. to 50ft. high. Wood dense, compact, strong, durable; used for piles, house-blocks, fencing, &c., and occasionally for inlaying.

FRAXINUS (*Tournefort*). The Ash.

Fraxinus excelsior (*Linne*). "The Common Ash." Europe, Temperate Asia.—Height, 80ft. to 100ft. Wood remarkably strong, light, and elastic; used for axle-beds and all kinds of wheelwrights' work (except spokes), spade-trees and tool-handles, implements, blocks, bendware, oars, and many other purposes.

F. Americana (*Linne*). "White American Ash." Canada to Florida.—Similar to the preceding species. Timber applied to the same purposes, but somewhat stronger; waved logs are utilized for furniture. Largely imported into England.

OLEA (*Linne*). The Olive.

Olea Cunninghamii (*Hooker f.*). "Maire-raunui," "Black Maire." New Zealand, North Island. —A tree of large dimensions, producing remarkably heavy, dense timber, of great strength and durability, used for bridge-building and other purposes where great strength is required; largely employed for machine-beds and bearings, &c.; it is also used for ornamental turnery, inkstands, &c

CATALPA (*Jussieu*).

Catalpa speciosa (*Walter*). Valley of the Mississippi, &c.—A tree 40ft. to 80ft. high, affording timber of remarkable durability, although not of the largest dimensions. This species is now being planted in Canada for railway-sleepers and other purposes where durability is required.

C. bignonioides (*Walter*). Carolina, Georgia, Florida, &c.—Similar to the last, 40ft. to 60ft. high. Wood valued for railway-sleepers, fencing, &c. Not adapted to the climate of the South Island, as it suffers from early winter frosts. It is better known to gardeners as *C. syringæfolia* (Sims), and has been cultivated under that name in England for many years.

MYOPORUM (*Banks* and *Solander*).

Myoporum lætum (*Forst*). "Ngaio." New Zealand, Kermadec Islands to Southland.—A shrub or small tree, 30ft. high, of great value for sheltering littoral plantations. Wood hard, dense, durable; used for house-blocks, posts, furniture, and turner's work.

VITEX (*Linne*).

Vitex littoralis (*A. Cunningham*). "The Puriri." New Zealand, from the North Cape to Poverty Bay and Cape Egmont.—This affords one of the most durable timbers known—dense, heavy, and of great strength. It makes the best railway-sleepers, and is unsurpassed for piles, sills, house-blocks, machine-beds, bridges, and all purposes where great strength and durability are required. The foliage is very striking, and presents an appearance almost unique amongst New Zealand trees. It is easily cultivated near the sea as far south as Cook Strait, but south of Poverty Bay will not succeed in inland localities, being easily affected by frosts.

LAURELIA (*Jussieu*).

Laurelia novæ-zelandiæ (*Hook f.*). "Pukatea." New Zealand, from the North Cape to Southland. —Height, 80ft. to 120ft., giving off large buttresses at the base of the trunk. Timber firm, of even texture, tough and elastic, but rather soft; not durable when in contact with the ground, but of great value for general house-building, boat-building, and furniture; boards used for roofing-purposes have remained sound after being in use seventeen years; nails may be driven into boards without causing them to split. Should be planted only in moist soils.

L. aromatica (*Jussieu*). Chili.—Attains larger dimensions than the preceding species. Timber applied to similar purposes, but is said to possess greater durability.

LITSEA (*Lambert*).

Litsea calicaris (*Bentham* and *Hooker f.*). "Mangeao." New Zealand, North Cape to Rotorua. —A small tree, 30ft. to 40ft. high, trunk 1½ft. to 2½ft. in diameter. Wood white, even, firm, and remarkably tough; employed in Auckland for bullock-yokes, ships' blocks, &c.; but the supply is said to be running short, and inferior woods are substituted in its place.

GREVILLEA (*R. Brown*).

Grevillea robusta (*A. Cunningham*). "Silky Oak." South-eastern Australia. —A beautiful tree, with fern-like foliage, attaining upwards of 100ft. in height. Wood firm, elastic; utilized for coopers' ware and cabinet-building. A fine specimen of this tree formerly grew in the old garden of the Auckland Domain, but was barbarously chopped down for firewood. Small specimens are to be seen in the vicinity of Wanganui and other places.

BUXUS (*Linne*). The Box Tree.

Buxus sempervirens (*Linne*). "The Turkey Box." Southern Europe, Temperate Asia.—Height, 5ft. to 30ft. Wood smooth, dense, and heavy, weighing nearly 69lb. to the cubic foot when dry. Used for mathematical and musical instruments, weaving-machinery, rollers, &c., and especially for wood-engraving. It is largely imported into England from Spain, and from Black Sea ports; but the supply is falling off, and sticks 1½in. in diameter find ready sale. The box should be planted in calcareous or gravelly soils. As it will flourish in rocky places, it affords the means of utilizing many waste spots where nothing else can be cultivated with profit. It is, however, of slow growth, rarely exceeding from 6in. to 9in. in a year.

ULMUS (*Linne*). The Elm.

Ulmus Americana (*Linne*). "White Elm." Nova Scotia to Georgia.—Height, 60ft. Timber light, but durable, especially under water. Used for hubs, planking for carts, wagons, but not fully equal to the English elm.

U. racemosa (*Thomas*). "Cork Elm." Eastern United States.—Timber similar to the last; tough and strong. When waved and curled, much used for furniture.

U. campestris (*Linne*). "The English Elm." Europe, Temperate Asia.—Height, 60ft. to 100ft.; trunk, 2ft. to 4ft. in diameter. Timber red, stout, tough, durable under water, or when kept entirely dry, but in the latter case frequently attacked by a small boring beetle; formerly used for bows; extensively used for hubs and wheelwrights' planking, ships' blocks, keels, pump-

trees, coffins, &c. The small tops are converted into the sides and ends of tin-plate boxes to an immense extent.

U. montana (*Withering*). "Wych Elm." Northern Europe.—Height, 50ft. to 80ft. Timber of stouter grain than the English elm, and more liable to split. This species is often used as a stock for grafting the English and other kinds, as it never throws up suckers. The bark is extremely tough, and was formerly twisted into ropes.

U. fulva (*Michaux*). "Slippery Elm." Eastern United States.—Height, 40ft. to 60ft. Timber used for hubs and other wheelwrights' work. Bark mucilaginous; largely employed in medicine, especially in America, forming the "slippery-elm powder" of the druggist.

CARYA (*Nuttall*). Hickory.

Carya alba (*Nuttall*). "White Hickory." New Hampshire, Carolina, Pennsylvania, Georgia, Louisiana.—Height, 60ft. to 80ft. Wood white, hard, even, tough, and elastic; not durable; used for axe-handles, implements, carriages, bendware. The edible fruits are the hickory-nuts of commerce.

C. porcina (*Nuttall*). "Hognut." Eastern United States, Canada.—Of similar qualities to the preceding. Wood frequently used for axe-handles, &c.

C. olivæformis (*Nuttall*). "Pecan-nut." Louisiana, Arkansas, Missouri, Texas.—Height, 60ft. Timber strong, elastic, more durable than either of the preceding. Chiefly cultivated for its nuts, which form an important article of commerce.

JUGLANS (*Linne*). The Walnut.

Juglans regia (*Linne*). "The Common Walnut." Greece, Central Europe, Black Sea, Burmah, China.—A variable tree, from 50ft. to 90ft. high, widely cultivated for its fruit. The timber in great demand for gun-stocks, furniture, pianoforte-cases, &c., and is largely imported into England from the ports of the Black Sea.

J. nigra (*Linne*). "Black Walnut." Eastern United States.—Wood extensively used for furniture. Nuts inferior to those of *J. regia*, but the tree is of more rapid growth.

J. cinerea (*Linne*). "Butternut." Eastern United States, Canada.—A smaller species than either of the preceding, and said to afford timber of greater durability.

CASUARINA (*Forster*).

Casuarina quadrivalvis (*La Billardiere*). "Sheoak." South-eastern Australia.—Suitable for planting on blown sand. Affords good firewood.

C. equisetifolia (*Forster*). Asia, Australia, Pacific Islands.—Valuable for planting on blown sand. Affords excellent firewood. A fine specimen of this species grew in the Auckland Domain, but was cut down for firewood.

BETULA (*Linne*). The Birch.

Betula alba (*Linne*). "White Birch." Temperate Regions of the Northern Hemisphere.—Height, 50ft. to 80ft. An elegant tree, the "queen of the woods." Timber even in the grain and compact, but soft; used for clogs, pattens, lasts, shoe-pegs, turnery; affords excellent charcoal for the manufacture of gunpowder. Numerous specimens are to be seen in the vicinity of Christchurch.

B. nigra (*Willdenow*). "Black American Birch." Canada, Carolina, Florida, Virginia, &c.—Height, 80ft. to 90ft., affording timber of larger dimensions than any other species. Wood used for similar purposes to the preceding; also for furniture and carriage-building. It is imported into Great Britain for cabinet-work under the name of "American birch."

B. lenta (*Willdenow*). "Cherry Birch." Canada, Northern United States.—Wood of a deep red colour, compact and even in texture, dense and heavy. Often beautifully curled, waved, or mottled. Extensively imported into England, where it is employed in the manufacture of furniture, under the same name as the preceding. It is the most durable of all birches, and is sometimes used in shipbuilding.

ALNUS (*Tournefort*). The Alder.

Alnus rubra (*Bengard*). "Red Alder." Vancouver's Island, California.—Height, 70ft. to 80ft. Timber used for piles, flooring, turnery, moulding-patterns, &c.

A. glutinosa (*Willdenow*). "Common Alder." Europe, and Temperate Regions of Asia.—Height, 50ft. to 60ft. Wood rather soft, but durable under water; utilized for pump-trees, turnery, moulding-patterns, brush-backs, clogs, pattens, and similar purposes. Suitable for planting on boggy land or by the sides of streams. Three or four fine specimens are to be seen in the Auckland Domain.

CARPINUS (*Tournefort*). The Hornbeam.

Carpinus Betulus (*Linne*). "Common Hornbeam." Temperate Parts of Europe and Asia.—A small tree, 40ft. to 60ft. high. Wood excessively tough, hard, and strong; used by millwrights, wheelwrights, turners, &c.; makes excellent charcoal for gunpowder. Valuable for forming shelter from high winds.

C. Caroliniana (*Walt*). "American Hornbeam." Canada to Florida.—A small species, rarely exceeding 30ft. in height. Wood valued for millwrights' work, &c.

QUERCUS (*Linne*). The Oak.

Quercus Robur (*Linne*). "The English Oak." Europe, Asia Minor, &c.—Two sub-species, each with numerous varieties, are generally recognized—1, *pedunculata;* 2, *sessiliflora*. The former has the acorns developed on a long fruit-stalk; in the latter the acorns spring directly from the

axils of the leaves, without the intervention of a fruit-stalk. Although both forms are generally distributed, the former is more abundant than the latter. In the mature state there is usually but little difference in the general habit and appearance of the two forms. The timber of both is characterized by great density and durability. In Great Britain the best surveyors for the navy "have not been able to discover any important difference between the two varieties," or, in most cases, even to distinguish one from the other. The timber is largely employed in shipbuilding, and in all constructive works where great strength and durability are required; also for the beds of railway-carriages, spokes, furniture, &c. The bark is one of the best known for tanning. In New Zealand this species makes an average growth of rather more than 2ft. per annum, which is greatly in excess of its growth in Britain. Trees over twenty-five or thirty years of age, however, seem to grow but little faster here than in England.

Q. Lusitanica (*Webb*). "Spanish Oak." Basin of the Mediterranean, &c.—A variable species, some forms of which afford excellent timber, of large dimensions.

Q. Lusitanica (*Webb*), var. infectoria.—A small tree. Produces the galls of commerce, largely used in the manufacture of ink.

Q. lyrata (*Walter*). Carolina, Georgia, Florida, Louisiana.—Suitable for planting in wet situations.

Q. Prinus (*Linne*). "Swamp Oak." Florida, Carolina, Louisiana, Missouri, &c.—Height, 80ft. Specially valued for coopers' work, and used for general building-purposes, &c., but less durable than other species.

Q. alba (*Linne*). "White Oak." Canada to Texas, &c.—Height, 80ft. to 100ft. A noble species, affording timber of large dimensions and of great durability, used for constructive works, railway-sleepers, general building-purposes, furniture, railway-carriage framing, &c. Largely imported into England under the name of "Quebec oak."

Q. Ilex (*Linne*). "Evergreeen Oak." Southern Europe, Northern Africa, Himalaya Mountains.—It ascends Mount Etna to the height of 3,200ft., and the Himalaya Range to 10,000ft. The timber is remarkably dense and heavy, but extremely durable, and is used for shipbuilding, bridges, wheelwrights' work, &c. This species exhibits a considerable amount of variation. The acorns of some of the varieties are sweet and edible. *Q. Ilex* is specially adapted to littoral situations, but is of rather slow growth.

Q. Suber (*Linne*). "The Cork Oak." Algeria, Barbary, Canary Islands, Southern Europe, Corsica, Sardinia, &c.—A small species, from 20ft. to 40ft. in height, of great value on account of its cork: it is, in fact, the only tree that produces cork in sufficient abundance to form an article of commerce. The acorns, when roasted, form an article of food in Spain. A fine specimen still exists near Exeter (Devon)—its height is 60ft., the circumference of its trunk is 12½ft. An Auckland specimen, planted by the late Dr. Sinclair, is now 45ft. high, the diameter of the head being from 35ft. to 40ft.; the trunk is 17½ft. long, and 26in. in diameter at two feet from the ground. The outer layer of bark, forming the cork, has been twice removed.

Q. dilatata (*Lindley*). Himalaya Mountains.—Height, 80ft. to 100ft. An evergreen oak, affording timber of great strength, elasticity, and durability.

Q. Cerris (*Linne*). "Turkey Oak." Central and Southern Europe, Western Asia.—A variable species, attaining the height of over 100ft.; producing a timber of great value for the battens of ribbon-looms, furniture, coopers' ware, and general building-purposes, but not equal in strength and durability to the English oak. It is a very handsome species, of rapid growth, and specially adapted to the New Zealand climate. The Lucombe oak is a hybrid between this species and the cork oak. It has a singularly noble and symmetrical appearance, and is of rapid growth, making from 2ft. to 4ft. in a season. It is nearly evergreen, the old leaves being simultaneously forced off, while still green, by the development of the new. The timber is of firm and even texture, straight-grained and durable. Unfortunately, this variety can only be propagated by grafting, so that it is scarcely adapted to forestal purposes.

Q. Ægilops (*Linne*). Valonia, Greece, Cilicia, Islands of the Mediterranean, Palestine, Asia Minor.—The cups and half-ripe acorns are largely used for special tanning purposes, under the name of "valonia," and are imported into Great Britain to the value of upwards of half a million sterling per annum.

Q. coccifera (*Linne*). "The Kermes Oak." Southern Europe, Asia Minor, North Africa.—Scarcely suitable for forestal purposes; but valuable on account of its supporting an insect (*Coccus ilicis*) which yields a scarlet dye, and forms an important article of commerce.

Q. rubra (*Linne*). "Red American Oak." Canada, Georgia, Texas.—A hardy species, capable of adapting itself to a great variety of soils. Timber of large dimensions, but not of the first quality; used for general building-purposes, cooper's work, &c. The pale-yellow tints of the leaves in spring, and their purple or red hues in autumn render it of great value to the landscape-gardener.

Q. palustris (*Du Roi*). "Marsh Oak."—Height, 80ft.; trunk, 3ft. to 4ft. in diameter. A species of rapid growth, affording a strong and elastic timber, specially adapted to the purposes of the cabinet-maker.

Q. coccinea (*Wangenheim*). "The Scarlet Oak." Massachusetts, Ohio, Texas, Georgia, Virginia, &c.—Of similar dimensions to the above. The timber is not of the highest quality; but the brilliant scarlet tint of the autumnal leaves renders it invaluable in situations where picturesque effect is desired.

Q. Skinneri (*Bentham*). Guatemala, Mexico.—A noble species, producing excellent timber, of great durability and of large dimensions. The acorns are 1½in. in diameter.

Q. sideroxyla (*Humboldt, Bonpland*).

Q. Xalapensis (*Humboldt*).—These fine Mexican species are stated to afford timber of large dimensions and extreme durability. The acorns are said to be edible.

CASTANEA (*Tournefort*). The Chestnut.

Castanea vulgaris (*Lamarck*). "Spanish Chestnut." Southern Europe, Western Asia.—Height, 60ft. to 100ft. Timber strong, elastic, and durable; nearly equal to English oak in value, although not of equal density. Highly valued for its fruit in all temperate countries. In this colony it commences to fruit at an early age.

FAGUS (*Linne*). The Beech.

Fagus obliqua (*Mirbel*). Chili.—Height, 70ft. Affords a stout heavy, timber; used for general building-purposes, and stated to be durable.

F. sylvatica (*Linne*). "Common Beech." Europe, Temperate Asia.—Height, 50ft. to 90ft. Attains its highest development on calcareous soils, and requires close planting to develop straight trunks of any great length. Wood hard, compact, smooth; used for a large variety of purposes, most extensively for cheap furniture, millwright's work, turnery, baskets, tool-handles, &c. It has been profitably utilized for railway-sleepers when treated with creosote, although in its natural state it is not durable when exposed.

F. Menziesii (*Hooker f.*). "Silver Beech." New Zealand, Te Aroha to Riverton.—A noble species, 60ft. to 90ft. high, and from 2ft. to 4ft. in diameter. Wood compact, firm, even in the grain, fissile, and easily worked. Used as fencing-posts it does not last more than from three to five years—house-blocks may last seven years; it is, however, of great value for inside work, and still more for pipe-staves and furniture; not unfrequently used for shingles.

F. fusca (*Hooker f.*). "Tooth-leaved Beech." Kaitaia to Southland.—The most valuable of all the New Zealand beeches, affording timber of large dimensions, and of great strength combined with great durability. Highly valued for railway-sleepers, bridges, and constructive works. The New Zealand beech-forests are easily renewed if fenced so as to exclude cattle, and left to Nature. All the species may be cultivated with ease.

F. Solandri (*Hooker f.*). "Entire-leaved Beech." New Zealand, from Hokianga southwards.—A valuable species, but the timber is inferior to that of the tooth-leaved beech.

F. Cunninghamii (*Hooker f.*). "Tasmanian Beech." Victoria, Tasmania.—An evergreen species, often attaining large dimensions. In general appearance and in quality of timber approaching the silver beech (*F. Menziesii*) of New Zealand.

SALIX (*Tournefort*). The Willow.

Salix triandra (*Linne*). "Triandrous Willow."—A variable species, several forms of which are of great value for basketwork; one of the best of these is var. *amygdalina*—the almond-leaved willow—which is highly esteemed for the finer and medium kinds of basketwork.

S. Russelliana (*Smith*). "The Bedford Willow." Europe.—Height, 60ft. to 80ft. Timber light, tough, and elastic, but not durable; not readily combustible. Used for the manufacture of cricket-bats, planking for carts and wheelbarrows, brush-backs, &c.; but not durable when exposed. The bark contains salicin. An infusion of the bark of young shoots is employed in England as a tonic. Although this willow is often planted for poles, for hoops, and bendware, its wood is less tough than that of the Huntingdon willow (*S. alba*). By many writers it is considered to be of hybrid origin, and is usually referred to *S. fragilis*. It is the *S. viridis* of Fries.

S. alba (*Linne*). "Huntingdon Willow." Europe, Northern Africa, Western Asia.—Height, 40ft. to 60ft. Timber similar to that of the Bedford willow; has been used for rafters and other inside building-purposes, and will last for over a century; but is not durable when exposed. This species is extensively planted in Europe for poles for crates, hoops, bendware, rake- and broom-handles, &c.; but is not suited for basketwork, although occasionally used for that purpose when good kinds are not available. Affords good charcoal for the manufacture of gunpowder.

S. caprea (*Linne*). "Goatsallow." Europe, Northern Asia.—A small tree, 30ft. to 40ft. high. Wood used for sheep-hurdles, hoops, bendware, broom-handles, and affords good charcoal for the manufacture of gunpowder. Extensively planted for undergrowth in coppice-woods, as it does not burn readily.

S. daphnoides (*Villars*). S. daphnoides (*Villars*), var. acutifolia. Northern Europe and Asia.—A rapid-growing species, 30ft. to 50ft. high, applied to the same purposes as the preceding, and of greater value. Var. *acutifolia* is an excellent osier for superior basketwork.

S. viminalis (*Linne*). "The Common Osier." Europe and Northern Asia.—One of the best osiers for strong basketwork, hoops, crates, &c.

POPULUS (*Tournefort*). The Poplar.

Populus alba (*Linne*). "The Abele." Southern Europe, North Africa, and Asia, China, and the Himalayas.—Height, 60ft. to 90ft. Wood, reddish-white, soft, but not easily ignited; used for similar purposes to the willows, although not so tough.

P. tremula (*Linne*). "The Aspen." Europe, North Africa and Asia, Japan.—Usually of smaller dimensions than the preceding. Wood used for similar purposes, also for flooring.

P. Euphratica (*Olivier*). Temperate Asia, Algeria.

P. Canadensis (*Desfontaines*).—Height, 120ft. Remarkable for its rapid growth and large dimensions. Wood white, soft, and light. Valued for flooring, as it does not readily take fire.

P. nigra (*C. Bauhin*). "Black Poplar." Europe, Temperate Asia.—Almost equalling the preceding species in dimensions, but of less rapid growth. Wood valued for flooring, especially for factories, workshops, &c. *P. nigra*, var. *fastigiata*, is the Lombardy poplar.

LIBOCEDRUS (*Endlicher*). Incense Cedar.

Libocedrus decurrens (*Torrey*). "Californian Incense Cedar." Oregon, California.—Height, 150ft., with a trunk from 3ft. to 6ft. in diameter. Timber rather light, but extremely durable; used

for general building-purposes, cabinet-making, fencing, &c. This plant is often confused with *Thuya gigantea* (*T. Lobbi*).

L. tetragona (*Endlicher*). "Alerze." Magellan Straits to Valdivia.—Trunk from 80ft. to 100ft. high, affording one of the most imperishable timbers known, although, like all its congeners, of a light quality. Used for general building-purposes, railway-sleepers, &c. The inner bark is manufactured into tow, which, on account of its durability in water, is used for caulking the joints of boats and small sailing-craft.

THUYA (*Linne*). The Arborvitæ.

Thuya gigantea (*Nuttall*). "Oregon Cedar." North-west America, from the Rocky Mountains to the Pacific.—Trunk from 150ft. to 200ft. high, or even higher in alluvial districts, and of large diameter. Timber extremely durable, adapted to a great variety of purposes. This fine tree is, perhaps, better known in gardens as *Thuya Lobbi*; it flourishes in all parts of the colony, and, from its rapid growth and the high quality of its timber, ought to be widely planted. It makes excellent breakwinds, and bears clipping freely when planted for hedges.

T. occidentalis (*Linne*). "American Arborvitæ," "Swamp Cedar." Canada and Middle States of North America.—Trunk 60ft. in height. Timber extremely durable, and of great value for many purposes. Adapted to moist situations, and might be employed to replace the kahikatea.

T. Lawsoniana (*Bentham* and *Hooker*). Oregon and California. (Cupressus Lawsoniana, *Murray*.)—Height, 80ft. to 100ft., affording a durable timber, of great value for general purposes.

T. Nutkaensis (*Bentham* and *Hooker*). Oregon, Vancouver Island, &c. (Cupressus Nutkaensis, *Lambert*.)—Similar to the preceding species.

CUPRESSUS (*Linne*). The Cypress.

Cupressus macrocarpa (*Lambert*). "Californian Cypress." California.—Attains 120ft. in height, and affords valuable timber when close-planted. Isolated specimens develop wide-spreading branches, which are liable to curious swellings and distortions at their junction with the trunk. These affected branches die out sooner or later, and ultimately lead to the death of the tree. One of the best trees for shelter, and will bear clipping well. It flourishes in almost any soil if moderately dry.

C. torulosa (*Don*). "Bhotan Cypress." Northern India.—A small tree, but affords one of the most durable timbers known. Not suitable for planting in the South Island.

C. sempervirens (*Linne*). "Upright Cypress." Southern Europe, Asia Minor, Mount Lebanon, &c.—From 60ft. to 80ft. in height. Timber extremely durable, adapted for a great variety of purposes. Specially suited for planting in cemeteries.

TAXODIUM (*L. C. Richard*). Deciduous Cypress.

Taxodium distichum (*Richard*). "Bald Cypress." Southern States of North America.—A deciduous tree, with feathery foliage. Height, 70ft. to 100ft.; trunk from 6ft. to 15ft. in diameter. Timber extremely durable, smooth-grained, but rather light; used for building-purposes, railway-sleepers, fencing, &c., as well as for furniture. Requires a moist soil.

SEQUOIA (*Endlicher*).

Sequoia sempervirens (*Endlicher*). "Redwood." California.—Attains the height of 200ft. and upwards, with a diameter of from 6ft. to 12ft. Timber durable and smooth-grained, although light; largely employed for general building-purposes, cabinet-making, railway-sleepers, fencing, &c.; but not suitable for constructive works. Flourishes in New Zealand, but grows rather late in the autumn, so that the leaves are occasionally injured by frost or by cutting winter winds. May be planted to replace the kauri in the North Island. On the west coast of the South Island its rate of growth exceeds 2ft. per annum.

S. gigantea (*Torrey*). "Mammoth Tree." California. (Wellingtonia gigantea, *Lindley*.)—The trunk has the largest diameter of all known trees, although inferior to certain eucalypts in height; a few specimens are known upwards of 300ft. in height, and fully 30ft. in diameter at 6ft. from the ground; but usually they are of smaller dimensions. The timber is light and somewhat brittle, but possesses considerable durability. The tree flourishes in all parts of the colony, and, at an elevation of 2,500ft. in the Southern Alps, makes an average growth of nearly 2ft. per annum. It seems specially adapted to the moist climate of the west coast of the South Island.

PHYLLOCLADUS (*Richard*). Celery-topped Pine.

Phyllocladus trichomanoides (*Don*). "Tanekaha." New Zealand, chiefly in the Auckland and Hawke's Bay Districts.—A handsome tree, 60ft. high. Wood white, tough, and strong; easily worked. Bark of great value for tanning, and as an organic mordant for certain shades. Of rapid growth when planted in good soil.

PODOCARPUS (*L'Heritier*).

Podocarpus Totara (*A. Cunningham*). "The Totara." New Zealand.—A fine tree, 40ft. to 70ft. high, or more; 2ft. to 4ft. in diameter. Timber light, elastic; easily worked, and of extreme durability; highly valued for railway-sleepers, ground wall-plates, general building-purposes, shingles, bridges, and constructive works; unequalled for marine piles. When established, the average growth of young trees is about a foot per annum; but in specially favourable situations the year's growth is over 2ft. The totara forms an excellent shelter-fence, and will bear clipping as freely as the English yew.

AGATHIS (*Salisbury*). Dammar Pine.

Agathis australis (*Bentham*, and *Hooker f.*). "Kauri." (Dammara australis, *Lambert.*) New Zealand, North Cape to Mercury Bay and Kawhia.—A noble tree, 80ft. to 150ft. high, with a trunk 3ft. to 6ft. in diameter. The timber is one of the finest in the world; it is of firm, compact, yet silky texture; easily worked, strong, and durable; it is used for furniture, general house-building, bridges and constructive works, masts, deck-planking, and other purposes of naval architecture, and is adapted to a greater variety of uses than any other pine-timber. It was exported during the year ending the 31st December, 1885, to the value of £142,475; while the export of all other kinds together amounted only to £13,872. Kauri resin, which is produced entirely by this tree, was exported to the value of £342,151 during 1884, and £299,762 during 1885. Planted trees make an average growth of a foot per annum.

A. robusta (*Bentham* and *Hooker*). "Queensland Kauri." Queensland.—Attains fully 150ft. in height; but the timber, although valuable, is not equal to the New Zealand kauri. It is, however, of more rapid growth. Adapted to the warmer portions of the North Island.

ARAUCARIA (*Jussieu*).

Araucaria imbricata (*Pavon*). "Monkey-puzzle." Chili.—A noble tree, 150ft. to 200ft. in height, affording durable timber, easily worked, and adapted to a great variety of purposes. The resin is used as a remedy for wounds, and the seeds are edible. Suitable for mountain-forests, although of rather slow growth.

A. Bidwillii (*Hooker*). "Bunya-Bunya." Queensland.—Attains the height of fully 150ft., and affords a valuable timber of great durability. Nuts edible. Suitable for lowland cultivation in sheltered places in the North Island.

A. excelsa (*R. Brown*). "Norfolk Island Pine." Norfolk Island.—A noble pine, 150ft. to 200ft. in height. Timber not fully equal to the preceding, although more valuable than many kinds in common use. It is of rapid growth north of Wanganui, but is not adapted to the climate of the South Island. Numerous fine specimens are to be seen in the Auckland and Taranaki Districts.

PINUS (*Linne*).

A. *Species with Two Leaves in a Sheath.*

Pinus muricata (*Don*). "Bishop's Pine." California.—A small tree, rarely exceeding 50ft. in height, but very hardy, and flourishes in all parts of the colony.

P. inops (*Solander*). "Scrub Pine." Kentucky, Virginia, &c.—A small tree, well adapted to poor soils, and, like the *Pinaster*, will grow in blown sand. Produces tar and resin in abundance; but the timber is of little value.

P. mitis (*Michaux*). "Yellow Pine." New England States to Georgia.—Attains the height of 60ft., and affords a smooth-grained timber of great value.

P. contorta (*Douglas*). "Tamarac." British North America, California.—Height, 50ft. to 80ft. Affords a durable timber of great value for various purposes. Adapted to mountain districts.

P. Pinea (*Linne*). "Stone Pine." Southern Europe, Canary Islands.—Height, 60ft. to 80ft. Affords a useful timber. The large nuts are edible.

P. Pinaster (*Solander*). "The Cluster Pine." Southern Europe, Algeria. (P. maritima, *Lamarck;* P. novæ-zelandiæ, *Loddiges.*)—Height, 50ft. to 80ft. Wood soft, suitable for packing-cases. Yields resin abundantly. In Austria, tracts of Pinaster forest are leased for the extraction of resin on payment of an annual rental of 3d. or 4d. per tree. One of the best trees for planting on blown sand.

P. Halepensis (*Miller*). "The Aleppo Pine." Southern Europe, Georgia, Persia, Syria, &c.—Height, 40ft. to 60ft. Affording serviceable timber, although of small dimensions. Will grow on poor soils, and may be planted on blown sand. Excellent for shelter-belts, and flourishes in all parts of the colony.

P. sylvestris (*Linne*). "Scotch Pine." Northern Europe and Asia, extending to Siberia.—Height, 80ft. to 100ft. Affording one of the most valuable timbers of commerce. It is the red deal of most Baltic ports, the yellow deal of Onega and Archangel. In New Zealand its average rate of growth in lowland situations is nearly 3ft. per annum. It will, however, produce timber of greater value in alpine districts, and will prove one of the best species at our command for mountain-forests above 2,500ft. It yields tar and resin freely, and the cones have been used for tanning.

P. Laricio (*Poiret*). "The Corsican Pine." Southern Europe, Sardinia, Corsica, &c. P. austriaca (*Höss*). "Black Austrian Pine." Central Europe.—The latter plant would be more correctly considered as a variety of the former, and affords the more valuable timber of the two. It may be planted on poor soils, and resists high winds, even in the most exposed situations. Both species attain upwards of 100ft. in height, and are worthy of being generally planted.

P. resinosa (*Solander*). "Red Pine of Canada." Canada, Nova Scotia, &c.—A valuable pine, attaining the height of from 80ft. to 100ft., and affording a heavy resinous timber of great durability.

P. densiflora (*Siebold*). "The Japanese Pine." Japan.

P. Thunbergii (*Parlatore*). "Thunberg's Pine." China, Japan.

P. Massoniana (*Lambert*). "Masson's Pine." China, Japan.

Three useful species, from 60ft. to 80ft. in height, and affording serviceable timber. P. Thunbergii is the least valuable of the three.

B. *Species with Three Leaves in a Sheath.*

P. Kasya (*Rozle*). "Kasya." Nepaul.—A lofty pine, affording timber of great durability.

P. longifolia (*Roxburgh*). "The Long-leaved Pine." Cashmere, Nepaul, &c.—Height, 100ft.

Timber easily worked and extremely durable. A valuable species for warm, hilly regions. Leaves sometimes over a foot in length, pendulous.

P. Gerardiana (*Wallich*). "Gerard's Pine." Nepaul to Afghanistan, ascending to 10,000ft.—Height, 60ft. Affords useful timber of small dimensions. Of great value on account of its edible nuts, which are largely used as an article of food.

P. Sabiniana (*Douglas*). "Nut Pine." California.—Height, 100ft. Timber durable, but not of the first quality. Nuts edible. Suitable for planting in rocky places.

P. Coulteri (*Don*). "Dr. Coulter's Pine." California. (P. macrocarpa, *Lindley*.)—Height, 80ft. to 100ft. Nuts edible.

P. australis (*Michaux*). "Swamp Pine," "Pitch Pine." Southern United States.—This is one of the most valuable pines available for planting, but requires a fair depth of soil. It is from 80ft. to 100ft. in height, and yields a hard, dense, resinous timber of great durability, adapted to a great variety of purposes. It affords a large quantity of resinous products, and is one of the chief constituents of the famous pine-barrens of Georgia and the adjacent States.

P. Jeffreyi (*Balfour*). "Jeffrey's Pine." California, Oregon.—Height, 100ft. and upwards. Nuts edible.

P. rigida (*Miller*). "Pitch Pine." New England to Georgia.—Height, 70ft. to 80ft. Affords a heavy, resinous timber when growing in rocky places. Useful for planting in swamps; but the timber is less valuable than when grown in dry situations.

P. radiata (*Don*). "The Spreading Pine." California. (P. insignis, *Douglas*.)—Height, 80ft. to 100ft. Timber white, soft, not durable. Of great value for shelter, as it grows with great rapidity, from 3ft. to 4ft. per annum being a common rate in all parts of New Zealand. Instances of from 6ft. to 9ft. of growth in a single season are not uncommon. The foliage turns brown under cutting winds, and is liable to the attacks of an aphis; the wood is attacked by the larva of *Prionoplus reticularis*.

P. ponderosa (*Douglas*). "Yellow Pitch Pine." Western North America.—Height, 150ft. to 200ft. Timber dense, heavy, resinous, and durable; but rather brittle. Of special value for mining pumping-machinery.

P. Teocote (*Chamisso* and *Schlechtendal*). "Okote Pine." Mexico.—Height, 100ft. to 150ft. Timber easily worked, and of great durability.

C. *Species with Five Leaves in a Sheath.*

P. Hartwegii (*Lindley*). "Hartweg's Pine." Mexico.—Attaining the height of from 100ft. to 150ft. Yielding timber of great value and durability.

P. leiophylla (*Schiede* and *Deppe*). "Smooth Pine." Mexico.—Height, 60ft. to 80ft. Timber firm and durable.

P. pseudostrobus (*Lindley*). "The False Strobus." Mexico.—Of similar value to the preceding species.

P. tenuifolia (*Bentham*). Guatemala.—Height, 80ft. to 100ft. Affording useful timber. Not adapted to the climate of the South Island.

P. Cembra (*Linne*). "The Swiss Stone Pine." Central Europe to Siberia, the Kurile Islands.—Height, 80ft. to 120ft. Wood white, fine-grained, durable; suitable for cabinet-work, carving, &c.

P. flexilis (*James*). "Rocky Mountain Pine." California, British Columbia.—A rather small species, affording a compact, durable timber. Ascends to 13,000ft.

P. excelsa (*Wallich*). "The Bhotan Pine." Bhootan to Afghanistan, Macedonia, Roumelia.—Height, 100ft. to 150ft., affording a smooth-grained timber of great durability. Adapted to numerous purposes. Although most suitable for mountainous situations, it flourishes at the sea-level in several parts of the North Island, and it produces seed freely.

P. Strobus (*Linne*). "Weymouth Pine." Canada and Eastern United States.—A noble tree, 120ft. to 200ft. in height, affording smooth-grained, easily-worked timber, suitable for cabinet-making and all inside work, but not of great durability when exposed. It is largely imported into England under the name of "yellow pine." Especially valued by moulders for pattern-making.

P. monticola (*Douglas*). British Columbia, Oregon, California.—Similar to the above, but the timber is rather stouter in the grain, and of greater durability.

P. Lambertiana (*Douglas*). "The Giant Sugar Pine." British Columbia, Oregon, California.—The loftiest of all pines, sometimes exceeding 300ft. in height, with a diameter of more than 10ft.; usually smaller. Timber used for shingles, flooring, cabinet-making, joinery, and all inside work; smooth and even in the grain, and easily worked, but not of great durability when exposed. The cones sometimes exceed 18in. in length; nuts edible. Adapted to mountain districts.

P. Ayacahuite (*Ehrenberg*). Mexico.—Height, 120ft. to 150ft. Timber similar to that of *P. Strobus*, but usually of a red colour, and of greater durability.

CEDRUS (*Loudon*).

Cedrus Libani (*Barrelière*). "Cedar of Lebanon." Syria, Asia Minor, Cilicia, Cyprus.—Height, 100ft. Timber whitish or pale-red; easily worked, and durable. More suitable for planting for picturesque effect than for forestry.

C. Libani (*Barr.*), var. Atlantica. "African Cedar." Mount Atlas Range.—More valuable for forests than the typical form.

C. Deodara (*Loudon*). "Indian Cedar." Himalaya Mountains, Afghanistan to Nepaul.—A noble tree, 200ft. to 300ft. in height, with trunk from 5ft. to 10ft. in diameter. Timber yellowish, even-grained, and of extreme durability; adapted to general building-purposes, railway-sleepers, joinery, cabinet and finishing work, boat-building, &c. It is not subject to the attacks of insects, even when it has been in use for four hundred years.

In the lowland districts of this colony this species will not yield timber of the highest quality; but it will probably prove to be one of the most valuable kinds for mountain-planting, and especially for extending arboreal vegetation above the present limits, marked by the evergreen beech (*Fagus Cliffortioides*).

The leader of the deodar is pendulous, as in the Lebanon cedar, and continually varies its direction, making a complete circle every three years.

PICEA (*Link*). The Spruce Firs. (ABIES, *Don.*)

Until recently the Spruce Firs have been usually referred to *Abies* by British cultivators, *Picea* being reserved for the silver firs; in this respect following Linne, who inadvertently transposed the names as used by Pliny. Continental botanists, however, have generally reverted to the original application, which has been adopted by Bentham and Hooker in their "Genera Plantarum," and is followed here.

Picea nigra (*Link*). "Black Spruce." British North America, Eastern United States.—Height, 60ft. to 80ft. Timber stout, tough, elastic, adapted to inside work, flooring, rafters, coarse furniture, &c.; but not durable when exposed. This occurs in immense abundance in Canada, and is imported into England to a large extent under the name of "American spruce." Not adapted to lowland situations in the North Island, but of great value for mountain-forests. Excellent for shelter-belts for orchards, &c., and will bear clipping for hedges, &c.

P. orientalis (*Link*). "Eastern Spruce." Mount Taurus, Eastern Shore of the Black Sea.—Similar to the black spruce; but the timber is more durable, although of rather smaller dimensions.

P. obovata (*Link*). "Siberian Spruce." Ural Mountains, Altai Mountains.—Height, 60ft. to 100ft. A remarkably hardy species, affording useful timber of considerable durability, although of rather small dimensions. Adapted to sub-alpine situations.

P. excelsa (*Link*). "Norway Spruce." (Pinus Abies, *Linne;* Abies excelsa, *De Candolle.*) Scandinavia and Central Europe.—Ascends the Alps to fully 6,000ft. Height, 120ft. to 150ft. Timber much superior to the black spruce in all respects, and more easily worked. It is largely imported into England under the name of "Baltic white deal," and is specially valued for flooring-boards and all inside framing, also as a "white wood" for furniture. Although it rarely flourishes in lowland districts in this colony, it will prove of great value for sub-alpine and alpine forests.

P. Smithiana (*Link*). "Indian Spruce." (Abies Morinda, *Hut.*) Himalayan Mountains, Afghanistan.—A highly ornamental species, on account of its drooping branches. Timber white, soft, easily worked, suitable for all inside work, but not durable when exposed. Height, 120ft. Adapted to mountain-forests only.

P. polita (*Carriere*). "Tiger-tail Spruce." Japan.

P. Engelmanni (*Engelmann*). "Engelmann's Spruce." New Mexico, Rocky Mountains.—Height, 80ft. to 90ft. A hardy species, affording useful timber.

P. Alcoquiana (*Carriere*). "Alcock's Spruce." Japan.—Height, 80ft. to 120ft. Affording durable timber.

P. Menziesii (*Carriere*). "Blue Spruce." California, Oregon, British Columbia.—A noble species, affording excellent timber of large dimensions. Height, 100ft. to 150ft. Not adapted to dry situations, but of great value for mountain-forests.

TSUGA (*Carriere*). Hemlock Spruce.

Tsuga Sieboldii (*Carriere*). Japan.—A small tree, 25ft. to 30ft., producing ornamental wood, specially valued for furniture-making.

T. Canadensis (*Carriere*). "Hemlock Spruce." Canada, New England States.—Height, 60ft. Timber whitish, not durable when exposed, but much valued on account of its fissile properties; largely imported into England for lath-cleaving. Bark highly valued for tanning purposes, and affords the greater portion of the hemlock-bark extract largely exported from the United States to Europe. The cones are the most diminutive of any species in the order.

T. Mertensiana (*Carriere*). California, Oregon, British Columbia, Vancouver Island, &c.—Height, 100ft. to 120ft. Of more rapid growth than the preceding, affording timber of greater durability, but does not split freely. Bark valued for tanning.

T. Brunoniana (*Carriere*). "Indian Hemlock Fir." Nepaul, Sikkim.—Height, 100ft. to 120ft. Timber not durable when exposed.

T. Hookeriana (*Carriere*). California, British Columbia.—Height, 120ft. Of similar value to *T. Mertensiana.*

PSEUDOTSUGA (*Carriere*).

Pseudotsuga Douglasii (*Carriere*). "The Douglas Fir." (Abies Douglasii, *Lindley.*) California to British Columbia, Vancouver Island, Sitka.—Height, 150ft. to 250ft. and upwards. Timber red, of smooth, even grain, easily worked, and extremely durable. One of the most valuable conifers known, sometimes attaining fully 300ft. in height. This grand tree resembles most of the spruce and silver firs in one particular—its growth for the first two years after sowing is very slow; but after that period it becomes rapid in nearly all situations in the colony. It flourishes in nearly all localities, and, although it suffers from cutting winds on the Canterbury Plains, exhibits sufficient powers of resistance to make an average annual growth of from 3ft. to 4ft. On the mountains its growth will be less rapid, but the timber will prove of superior quality. It will be of great value for replacing native forests on the west coast of both Islands.

ABIES (*Link*). The Silver Firs. (PICEA, *Don.*)

Abies nobilis (*Lindley*). "The Douglas Silver Fir." Oregon, California.—Height, 150ft. to 300ft. Timber smooth and even in the grain, easily worked, durable. A valuable species for mountain districts.

A. religiosa (*Schlechtendal*). "Mexican Silver Fir." Mexico, Guatemala.—Height, 120ft. to 150ft. Wood white, and even in the grain; valued for its fissile properties.

A. vulgaris (*Poiret*). "Common Silver Fir." (A. pectenata, *De Candolle;* Pinus Picea, *Linne.*) Central and Southern Europe, from the Caucasus to the Carpathian Mountains.—Height, 120ft. to 150ft. A stately tree, affording white, rather soft timber, suitable for inside work, framing, &c., and especially for furniture; not durable when exposed.

A. Cephalonica (*Loudon*). "Greek Silver Fir." Island of Cephalonia, Greece.—A rather small species, which should be regarded as a variety of *A. vulgaris*. Height, 50ft. to 60ft. Timber easily worked, probably the most durable of all the silver firs. Adapted to mountain districts.

A. Nordmanniana (*Spach*). The Crimea and the Caucasus.—This is another variety of *A. vulgaris*. It attains the height of from 80ft. to 100ft., and affords valuable timber.

A. Cilicica (*Carriere*). "Cilician Silver Fir." Taurus Mountains.—A rather small species, 50ft. to 80ft. high. Timber easily worked, suitable for house-framing or any inside work, but not durable when exposed.

A. firma (*Siebold* and *Zuccarini*). Japan.—A fine species, 120ft. high and upwards. Timber not durable when exposed.

A. brachyphylla (*Maximowicz*). Japan.—Height, 100ft. to 120ft. In many respects similar to the preceding.

A. Pindrow (*Spach*). "Himalayan Silver Fir." Bhotan.—Height, 100ft. In lowland situations in the colony this species starts into growth early in the spring; so that its leaders are frequently killed by frost. It should be planted only in exposed positions.

A. Webbiana (*Lindley*). Himalayan Mountains, Afghanistan.—Height, 80ft. to 100ft. Timber soft, but durable, and easily worked. The cones of this and *A. Pindrow* afford a violet dye. The leaders and young shoots of this and other silver firs are often injured by late spring frosts when planted in lowland situations in New Zealand.

A. amabilis (*Forbes*). "The Lovely Silver Fir." British Columbia, Oregon, California.—Height, 100ft. to 150ft., producing timber of great value. Suitable only for mountain districts.

A. concolor (*Lindley* and *Gordon*). New Mexico, South California, Colorado.—Height, 120ft. to 150ft. Timber applied to a great variety of purposes.

A. grandis (*Lindley*). "The Lofty Silver Fir." Vancouver Island to Mendocino, California, Rocky Mountains, San Juan Island.—Height, 150ft. Timber valuable for inside work only.

A. Veitchii (*Lindley*). "Veitch's Silver Fir." Japan.—Height, 100ft.

A. Sachalinensis (*Masters*). Japan, Island of Saghalien.—Height, 120ft.

LARIX (*Miller*).

Larix pendula (*Salisbury*). "Black American Larch." Canada and North-eastern States.—From 60ft. to 90ft. in height. Of great value for railway-sleepers and other purposes where strength and durability are required.

L. Europœa (*De Candolle*). "Common Larch." The Alps and Central Europe, Siberia.—Height, 80ft. to 100ft. Timber stout in the grain, but of great strength and durability; used for general building-purposes, constructive works, railway-sleepers, shipbuilding, and many other purposes. Yields Venetian turpentine. The "Memel" timber, so largely imported into England in the form of "baulk," is yielded by this species; logs of the best quality are known as "Crown Memel," and fetch a high price on account of their great strength. Several years ago a wreck was found some distance above high-water mark near Okarito: it had been there so long that it was completely hidden by large trees which had grown up around it; but, on examination, it was found that the larch, of which it was chiefly built, was perfectly sound. This is as good a proof of the durability of the timber under unfavourable conditions as could be desired. The larch is not adapted to lowland situations in the colony, but is of great value for districts above 1,500ft. or 2,000ft., where it will be found to afford useful timber in from forty to fifty years.

L. occidentalis (*Nuttall*). "Western Larch." California, Oregon, British Columbia.—Height, 100ft. to 150ft. Timber of great durability, light, and tough; but not equal to the European larch in strength. Of great value for mountain-forests.

PSEUDOLARIX (*Gordon*).

Pseudolarix Kæmpferi (*Gordon*). "Golden Larch." Che Kiang, Northern China.—Height, 100ft. to 150ft., affording a timber of great durability. Suitable for mountain-forests.

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